CPU ™

COMPUTER POWER USER

AI

Artificial Intelligence

Tomorrow Is Today

- **Games**
- **Security**
- **Productivity**

January 2002
$5.95 U.S. $7.95 Canada

7 25274 81182 3

01>

I've got strength in numbers...and in options.

Dell | Home Notebooks

Inspiron™ 2500 Notebook

Practical and Affordable Mobility

- Intel® Celeron® Processor at 900MHz
- 12.1" SVGA TFT Display
- 128MB Shared SDRAM at 100MHz
- 10GB⁵ Ultra ATA Hard Drive
- Fixed Internal 24X Max CD-ROM Drive
- Intel Integrated AGP 3D Video with up to 8MB of Shared System Memory
- Sound Blaster® Compatible
- 4-Cell Li-Ion Battery
- Internal 56K⁸ Fax Modem

$1049 or as low as **$29**/mo for 45 mos.¹²
No payments for 90 days
for qualified customers.
E-VALUE Code: 00568-801109m

Recommended upgrade: $32
- Add a Targus Defcon Security Device, $41

Inspiron 4100 Notebook

Uncompromising Performance in a Thin and Light System

- Mobile Intel Pentium® III Processor at 866MHz-M featuring Intel SpeedStep Technology
- 14.1" XGA Display
- 128MB SDRAM at 133MHz
- 20GB⁵ Ultra ATA Hard Drive
- Modular 8X Max DVD-ROM Drive
- 16MB DDR ATI Mobility Radeon™ M6 4X AGP 3D Video
- Sound Blaster Compatible
- 8-Cell Li-Ion Battery with ExpressCharge™ Technology
- Internal 56K⁸ Fax Modem

$1599 or as low as **$48**/mo for 45 mos.¹²
No payments for 90 days
for qualified customers.
E-VALUE Code: 00568-801115m

Recommended upgrades:
- Add a Portable Canon® BJC-85 Color Printer, $299
- 14.1" Super XGA+ Super XGA+ TFT Display, add $99
- 8X CDRW Drive with Roxio's Easy CD Creator,® add $99

Inspiron 8100 Notebook

The Ultimate Multimedia Notebook

- Mobile Intel Pentium III Processor at 1.13GHz-M featuring Intel SpeedStep Technology
- 15" Super XGA+ TFT Display
- 256MB SDRAM at 133MHz
- 20GB⁵ Ultra ATA Hard Drive
- Fixed Internal 8X DVD-ROM Drive
- 16MB DDR NVIDIA® GeForce2 Go™ 4X AGP 3D Video
- Sound Blaster Compatible
- 8-Cell Li-Ion Battery with ExpressCharge Technology
- Internal 56K⁸ Fax Modem

$2149 or as low as **$64**/mo for 45 mos.¹²
No payments for 90 days
for qualified customers.
E-VALUE Code: 00568-801122a

Recommended upgrades:
- 30GB⁵ Ultra ATA Hard Drive, add $99
- 32MB DDR NVIDIA GeForce2 Go Graphics, add $99

The Experts

Spotlight

AI

Did you find the hidden CPU logo on our cover?
Turn the page for the answer.

Infinite Loops

Strange stats and other
oddball items from
computing's periphery

GREETINGS FROM SAMITLAND
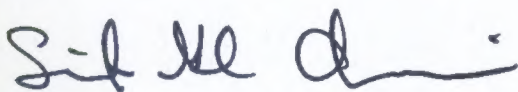
Welcome to the second issue of *Computer Power User* magazine. You've been giving us feedback, and we're doing our best to incorporate your suggestions and comments to improve and grow. I'm confident that you'll find our second issue better than our last. But that doesn't mean we're done. Oh no; we look forward to your continued feedback so we can create the publication you want to read.

The world of publishing is a strange one. Right now you're staring at the January 2002 issue, but it's well before Christmas. That's known as lead-time. And in this case, it's a good thing because it gives us a second opportunity to share tons of hardware and software with you before you finalize your holiday shopping list. (What do you mean you haven't thought about it yet?) For those of you silently compiling your components and peripherals, make sure you read our nForce (page 16) and VIA Apollo KT266A (page 21) reviews. Gamers on a budget shouldn't miss this month's "The PC Challenge" on page 40.

Oh, and before I forget, I'd like to welcome the latest addition to our panel of experts: **Kyle Bennett**. Welcome, Kyle. (All together, class: "Welcome, Kyle!" Good job.) We're delighted to add Kyle's knowledge to our growing brain trust. Many of you are probably already familiar with Kyle, but for the uninitiated, he's the man behind [H]ard|OCP (www.hardocp.com). Kyle's not known for beating around the bush. He calls things as he sees them. You can expect to hear some hard talk from the man himself in future months. Check out his debut column on page 38.

My, my, look at the time. I have to close up this issue and join the rest of the *CPU* gang heading to the pub. See you back here then— same time and place. Adieu until then. Please stroll through the issue and enjoy yourself.

Wishing you a safe and joyous holiday season,

[signature]

Samit G. Choudhuri, Publication Editor, *CPU*

In Hardware . . .

The Future Looks Bright For
LEP Displays

We have one word for you: Plastics. A polymer type of OLED (organic light-emitting diode), LEP (light-emitting polymer) displays can be more than small in horizontal and vertical dimensions, they can also be wafer-thin. This technology has been around since the late 90s, but its promise recently grew more enormous with the coupling of DuPont and CDT (Cambridge Display Technology).

This alliance increases the plastic holy grail of intellectual property held by both organizations, bringing DuPont's specialization in electroluminescent polymers into the mix. But this isn't the first time CDT has granted a license to a manufacturer. Since 1997, CDT has closed deals with Hewlett-Packard, Seiko-Epson, Bayer AG, OSRAM, and Philips/Hoechst. For good measure, Intel has also provided CDT with some funding.

To date, Seiko-Epson has done the most interesting work with LEP; it unveiled a 2-inch (diagonal), 2mm thick monochrome computer display as far back as February 1998. Hopes were high then, with Seiko-Epson researchers claiming that LEP displays would rival both LCDs and CRT monitors in terms of quality and cost. This would seem true, since LEP displays don't have the angular viewing problems that LCDs have, weigh less than LCDs, and don't require a backlight.

The hope remains, but according to Stewart Hough, vice president of business development for CDT, OEMs "are going to introduce the products in a controlled fashion." Philips, Delta, and OSRAM, for example, "are planning to start production and release products in the first quarter of 2002," while "Toshiba and Seiko are expected to go to full-color RGB displays probably for 3G cell phone applications as well as digital cameras and camcorders," possibly by the beginning of 2003.

In terms of cost to consumers, "the initial cost models look to be very competitive with LCDs," says Hough. "Longer term, the cost models that have been done by independent analysts indicate the active matrix light-emitting polymer displays would be less expensive than the active matrix LCDs by possibly up to 30%." ▲

Cat Scratch Fever

Omron (www.omron .com), the Tokyo manufacturer of electronic components and biometric and laser radar sensor products available in the United States, has used artificial intelligence technology to build a better cat. This cat doesn't shed, make allergies flare, or cough up hair balls. And best of all, it doesn't require a litter box.

Based on the Japanese word for cat, the NeCoRo is in limited release, with 5,000 units available. At press time, there were no definite plan to sell in the United States. An Omron spokesperson says the company would like to sell the product overseas but first needs to test its popularity at home and then must establish maintenance facilities nearby to "operate" on NeCoRo cats should they become "injured."

With touch-sensitive sensors embedded in the NeCoRo's head, chin, and back; a microphone to detect sounds; vision sensors; and a speaker that generates 48 different cat sounds, at first glance the NeCoRo seems remarkably similar to Sony's insanely popular AIBO.

But whereas AIBO has a memory slot and uses optional software (er, excuse me, AIBO-ware) to play games and do tricks, the NeCoRo is designed to focus on learning. Think of a cross between AIBO and one of those virtual "pets" that beeps when it needs to be fed.

Like the AIBO, you can give the NeCoRo a name it will come to recognize and respond to. But with the NeCoRo, you get the friendly extras: smiles, blinking eyes, and soft fur. The NeCoRo lives approximately two hours max on its nickel hydrogen battery, but that's identical to the AIBO's staying power. At press time, the NeCoRo had begun hitting the shops with a price tag of 185,000 yen ($1,528); the AIBO is priced at 98,000 yen ($810). ▲

PASS IT ON!

Are your friends, co-workers, neighbors or relatives Power Users like you? Introduce them to CPU! Simply detach these FREE TRIAL ISSUE subscription cards and pass them on TODAY!

cpu
COMPUTER POWER USER™

Don't let your friends miss out on this opportunity to "Get Powered" with CPU!
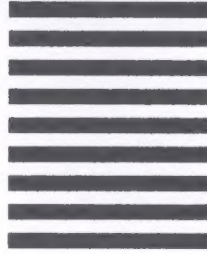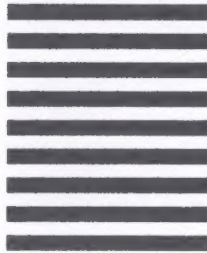
Embedded & Wireless Meet In
Bluetopia

G o ahead: Close your eyes, click your heels, and say "There's no place like Bluetopia" three times. It's true, there is no place like Bluetopia—yet. BrightCom (www.brightcom.com), a relative newcomer known for its IntelliBLUE Bluetooth application processors, recently joined with Stonestreet One (www.stonestreetone.com), a 10-year-old company that develops embedded applications, to create a self-sufficient application processor.

Once in place, developers will get the best of both worlds. To the table, Stonestreet One brings its easy-to-use Bluetooth protocol stack (dubbed Bluetopia for this merger of wireless minds) for embedded OSes, and BrightCom brings its BIC2101 Bluetooth Application Processor for USB and serial-type applications

including cordless phones, cameras, and dial-up networking.

According to a joint press release from BrightCom and Stonestreet One, Bluetopia has a shared API and is compatible with Intel, Hitachi, Mitsubishi, ARM, and DSP microprocessor architectures. BrightCom's BIC2101 chip, which is Bluetooth 1.1 compliant, already provides a no-host solution. Its repertoire can only expand with Stonestreet One's contribution. ▲
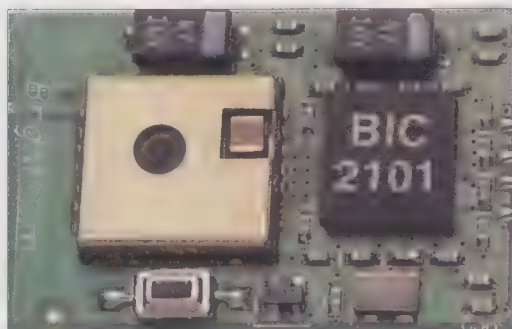
Jumping Jack 0.13-micron *Flash*

I n a move intended to get a jump on its competitors, Intel recently announced that it's set to release a flash memory chip built on 0.13-micron process technology. According to a press release, Curt Nichols, vice president and general manager of Intel's Flash Products Group, said, "Our goal is to ship 0.13-micron flash products before our closest competitors ship 0.18-micron products, putting Intel two product generations ahead of the next largest supplier."

Intel claims that the new chip is half the size of Intel's 0.18-micron chip and consumes less power. OEMs will be able to gobble up the 32Mb chip, currently in production, for $11 each in 10K-unit quantities. The 64Mb chip, slated for production late in 2002, will go for $19 each, also in 10K-unit quantities. Consumers will benefit when OEMs include the chip in newer, and most likely smaller, cell phones; each chip powers a cell phone and stores user data. ▲

Sony Dwarfs Its Competition

S ony (www.sony.com/vaio) recently debuted the C1MV, Sony's latest VAIO PictureBook and arguably the best combination of power and ultra-small design on the market. Running Windows XP Home Edition right out of the gate, the new C1MV weighs 2.2 pounds (including its lithium-ion battery, good for up to four hours) and is about the size of a quality paperback (1.2 inches high x 9.9 inches wide x 6.0 inches deep).

The C1MV is powered by a Transmeta Crusoe 5800-series 733MHz processor; has 256MB of RAM and a 20GB hard drive; and includes a pair of stereo speakers, a mono microphone, an 86-key keyboard, and an integrated modem. The C1MV's most eye-catching feature, though, is its 8.95-inch 1,280 x 600 SXGA LCD.
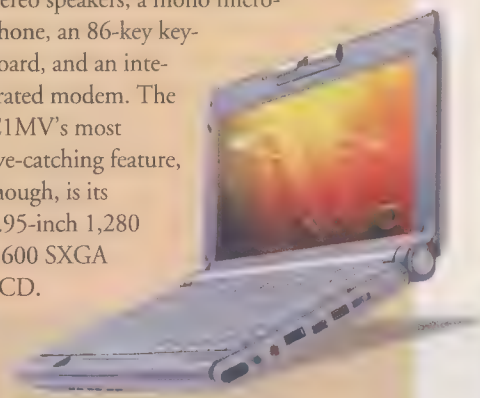
The Sony C1MV lacks some niceties that full-blown high-end notebooks offer, such as optical disc drives, but its capabilities are scalable. The C1MV has a 1:uDIMM RAM slot; a slot that supports PCMCIA Type II memory cards and CardBus cards; and a port replicator for AV in/out and USB 1.0, RJ-45 Ethernet, and VGA output. With a price tag somewhere in the vicinity of $1,900, the C1MV is bound to blow away the competition. ▲

In Software . . .

Winamp 3.0 Beta Now Available

Based on a brand-new platform code-named Wasabi, the latest working toward the final cut, which will do more than build on Winamp media library, and multiple playlist support. It has an enhanced playlist editor and a script compiler, which developers can use to write customized functions for the buttons. The Readme.txt file included with the download is an excellent guide to sinking your teeth into Winamp 3 capabilities. An SDK (Software Developer's Kit) with working C++ code samples is available as a separate download.

audio player from Nullsoft is currently available as a free 1.4MB download (www.winamp.com/download/wasabi). Officially released by America Online, the Winamp 3.0 Beta Developer Edition is geared toward skin, plug-in, and software developers and provides a big taste of what users can look forward to.

Nullsoft, a 15-person team working within America Online, is furiously 2.x's laurels. Instead of the individual steps Winamp 2 requires to locate, download, rearrange, convert, and burn audio files, Winamp 3 uses a highly customizable component system. This lets developers collapse multiple components into a single user step, such as pressing a button, to activate the entire gather-download-burn process.

Winamp 3 features MP3 audio support, a One caveat: Read the directions before downloading and don't try to overwrite your Winamp 2.x installation. Winamp 3 will run on any Windows OS since 98, but Nullsoft recommends it for 2000 or XP. A Winamp 3 Alpha is also available for Linux. ▲
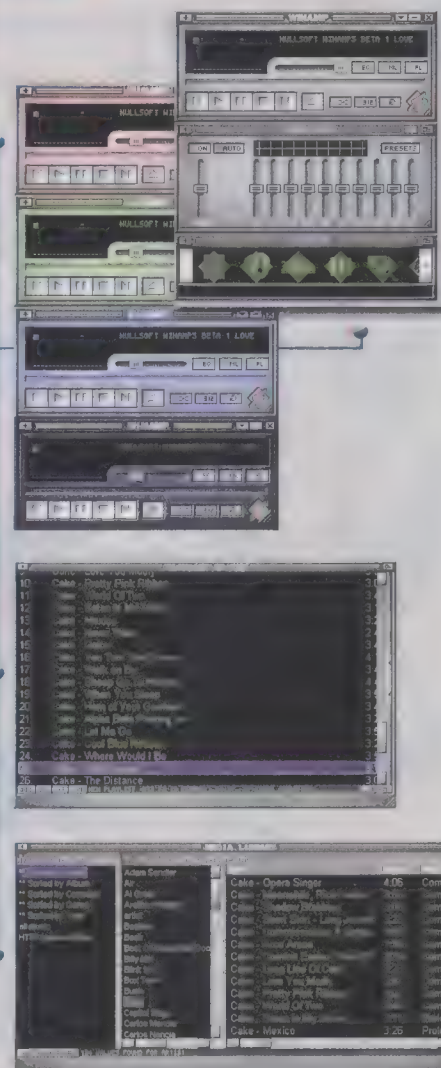
Wireless Network Cracking For Dummies

Wireless LANs have something new to worry about: AirSnort. This tool, which automates the process of cracking wireless networks, recently became available over the Internet. Knowledgeable network administrators have never considered the IEEE 802.11 to be an airtight standard for wireless networks, but it's a particularly low blow that this threat comes in the form of a simple-to-use, free tool.

802.11 includes the WEP (Wired Equivalent Privacy) system, which was supposed to be the main built-in security mechanism for wireless networks, but it is known to have flaws. "802.11 is not only insecure, it is robustly insecure," says Bruce Schneier, founder and chief technical officer of Counterpane Internet Security and author of "Secrets And Lies: Digital Security In A Networked World."

"Multiple vulnerabilities in the security protocol have been identified and exploited, and misuse and misconfiguration [of the protocol] only exacerbate the problem."

AirSnort takes aim at these weaknesses by grabbing encryption packets intended to protect data sent over the network; once it has gathered enough packets, it completes passwords, thereby gaining access to all network traffic. Even if both the encryption algorithm and the security surrounding the encryption are implemented correctly, "the security is based on a single shared secret password which is vulnerable to a brute-force attack," says Schneier. "But even if those three things were fixed, most people don't even bother to turn on the encryption feature. Most 802.11 wireless networks are completely open to anyone driving around with a scanner. Those that bother to implement the

I Want My DVD

The controversy began churning with the Digital Millennium Copyright Act's passage in 1998. The act maintained the legal validity of the CSS (content scramble system) for DVD encryption and asserted that viewing DVDs on PCs using software not licensed by the DVDCCA (DVD Copy Control Association) is a criminal act. It was clear, however, that the Windows and Macintosh OSes cornered the market, elbowing Linux right off the playing field.

Enter Eric Corley, who posted DeCSS, a Linux-friendly descrambler program, on his hacker e-zine 2600 Web site and got smacked with a lawsuit from Universal Studios. Universal argued in a letter to the U.S. Second Circuit Court of Appeals that "DeCSS is not information within the meaning of the First Amendment, much less a message; it is . . . a technical device for circumventing protection that copyright owners have installed on copies of their copyrighted works."

Corley countered that "DeCSS itself has no nonspeech elements. It is a set of instructions written in a specific professional language that expresses ideas to those who can read that language." The court disagreed.

However, a Nov. 1, 2001 decision by the California Court of Appeal, Sixth Appellate District, overturned the DeCSS ban. The appeals decision favored Andrew Bunner, who argued against the DVDCCA for his right to publish the program. The decision read, "DVDCCA's statutory right to protect its economically valuable trade secret is not an interest that is 'more fundamental' than the First Amendment right to freedom of speech." So while the studios stew, programmers everywhere are free—at least for now—to revel in their First Amendment right to speak in code. ▲

Dolby Surround Sound
Revs Up Games

It was only a matter of time before Dolby's Digital 5.1 surround sound would work its way into games and car audio, especially since the arrival of DVD technology, which incorporates Dolby Surround to maximize the audio tracks. With DVD-Video-heads juicing up their home entertainment systems to do justice to DVD-Audio sound and ferociously gobbling up DVDs as soon as they hit the shelves, there will undoubtedly be a hungry audience for Dolby Surround-encoded games.

Enter Eidos Interactive, maker of Tomb Raider. Its first release for Microsoft's Xbox game system, the teen-

Mad Dash Racing for Xbox is the first game to unleash 3-D-like multichannel sound thanks to Dolby Pro Logic II technology.

oriented Mad Dash Racing, hit the shelves with a $49.99 price tag. Mad Dash Racing is also Eidos's first game to incorporate Dolby's 5.1-channel Pro Logic II decoding. Pro Logic II builds upon the 4-channel Pro Logic technology Dolby introduced in 1987.

Highly compatible with earlier Dolby Surround products, Pro Logic II is designed to serve up a 3-D listening experience. To work effectively, the Pro Logic II processor requires five speakers and benefits from an additional subwoofer. While many competing digital sound processors use additional circuits and have modes that add echo or reverb, Pro Logic II elegantly uses servo circuits to derive output channels and remove undesired qualities from the existing tracks. ▲

provided security can be broken with a modicum of effort."

According to Doug Hale, director of product marketing for Rappore Technologies, companies need to assemble a security plan "such that WEP is not part of that plan." WEP provides security at the link layer, says Hale, and because that's built into the hardware "you've got to provide [security] at a higher layer in your stack. And of today's products, there are only two forms that

do that: SSL at the transport layer and VPN at the IP layer. Hale recommends that network administrators examine all the pros and cons associated with alternative security methods and implement the appropriate method. As if the free availability of AirSnort isn't enough to spur administrators into action, a new program called WEPcrack is in its alpha stage of development and looms as the next notable threat to wireless privacy. ▲

Internet . . .

What's In A .Name?

The personal domain is now available, thanks to the Global Name Registry and ICANN, the international, nonprofit Internet Corporation for Assigned Names and Numbers. And Namescout.com (www.namescout.com), a company with offices in Australia and Barbados, has announced its arrival as the first worldwide registrar for the .name domain.
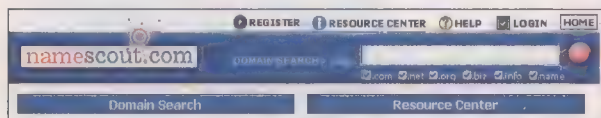
Whether you're ready to make an immediate splash in the Web pool, or you want to hold a place with (literally) your name on it, Namescout.com makes it easy. On the home page, you'll find a straightforward Domain Search engine to scout out existing names using a .com, .net, .org, .biz, .info, or .name domain. The results show whether a particular name is available with a particular domain. If the name you want to use is available, all you have to do is click Register Checked Domains, set up a Master Account, and place your order.

Prices are reasonable, starting at $25 for one year or $160 for 10 years. By comparison, registering a .com, .net, .org, .biz, or .info domain name costs $50 for two years (one year isn't an option) or $187.50 for 10 years. To help ease the pain of spammers finding out who you are and where you're at on the Web, Namescout.com also provides a temporary e-mail address to channel messages through its mail-forwarding server. This service is included in the price of registering your .name. ▲

BIOS Upgrades Available Online

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Check out www.smartcomputing.com/cpumag/jan02/bios to see the entire upgrade list.

MFR	File	Date available	URL
ABIT	KT7S5S, HPT 370 RAID BIOS version 1.11.0402	10/12/2001	www.abit.com.tw/eng/download /bios/bios-kt7a-raid.htm
ABIT	KG75E, HPT 370 RAID BIOS version 1.11.0402	10/12/2001	www.abit.com.tw/eng/download /bios/bios-kg7.htm
ABIT	KT7S5S, HPT 370 RAID BIOS version 1.11.0402	10/12/2001	www.abit.com.tw/eng /download/bios/bios-kt7a.htm
Aopen	AX34-U AX34U101 version R1.01	10/12/2001	www.aopen.com/tech /download/mbbios/ax34u.htm
Aopen	MX36LE 36LE106 version R1.06	10/12/2001	www.aopen/com/tech/download /mbbios/mx36le.htm
Aopen	AX3SP-U 3PU101 version R1.01BETA	10/16/2001	www.aopen/com/tech/download /mbbios/ax3spu.htm
Soltek	SL-75JV/75JV-X Z5JV-U9 version unknown	10/19/2001	www1.soltek.com.tw/English /home/01.htm
Soltek	SL-75KAV/KAV-X Q9 version unknown	10/18/2001	www1.soltek.com.tw/English /home/01/htm
Soltek	SL-75KIV 75KIV-C9 version unknown	10/18/2001	www1.soltek.com.tw/English /home/01/htm
Soltek	SL-65EP2B 65EP2-V version unknown	10/19/2001	www1.soltek.com.tw/English /home/01/htm

New On The 'Net

Here's a small sample of sites that have recently made their way to the Web.

Old-Fashioned Strategy. Strategy game addicts take note: If you've had enough of the standard fare, check out Orchid Enterprises (www.orchidenterprises.com). We can't attest

to the quality of the games it offers, but for £18 ($26) plus a £10 ($14) charge for shipping overseas from the UK, Orchid Enterprises sells Baboom, a "game of elimination." The game package includes an aerial-view game board, dice, 24 playing pieces, and a rule book. You can order online and yes, they accept American Express, MasterCard, and Visa. ▲

Web Destroyer. If you enjoy getting in on the ground floor of Internet games, here's another opportunity. Currently under development and due out in full force in the first quarter of 2002, Web Destroyer (www.web destroyer.org) will accommodate a virtually unlimited number of players. Essentially a strategic and tactical combat game, the site intends to let players communicate, fight, and trade with one another. Visit the Web site and contact the site's owner if you'd like to get in on the action. ▲

Wine Online. About an hour south of Monterey and Pebble Beach, inland and through the forest from Big Sur, lies the picturesque Scheid Vineyards. Visit its Web site (www.scheidvineyards.com), and you'll find about everything you would expect from a visit to the winery. Click The Landscape or The Tasting Room to see a few photos and get a feel for what Scheid Vineyards has to offer, or head straight for The Wine Basket to browse and order a variety of red and white wines, accessories such as corkscrews and wine glasses, and vineyard apparel. The prices are surprisingly reasonable (buy 'em by the case and get a 10% discount), and you won't have to drive yourself home. ▲

Compiled by Russell Shaw

You Get Paid
For That?

If you missed your chance to be a rock star but still want to get paid for playing around all day, read on. We found a description on Dice.com for a job we think you'd like. Here's our take.

**Manager
GUI Development
Natick, Mass.**

When you think of simulator software, the first thing that may come to mind is that flight sim game your kid is playing. But simulator software is a more serious endeavor. Many corporations use simulator software to research and develop real-world applications such as medical imaging and defense and aerospace systems.

Sounds like serious stuff, and it is. But working on the development of simulator software doesn't have to be so straightlaced. Take the job listing we found for the position of Manager of GUI Development for a company whose list of clients includes Texas Instruments, Cisco Systems, Boeing, General Motors, and NASA.

For $65,000 to $110,000 a year, you'd be leading a team focused on making the graphics contained in simulation products work. Some perks include wearing sandals and shorts in the summer, getting quarterly bonuses, and using the on-site exercise facility. The company will even treat you and your family to an annual, paid vacation weekend.

Now that's a job.

Online For The Holidays

Despite the recent downturn in the economy, Nielsen/NetRatings predicts a healthy holiday season for online retailers, both in terms of number of online shoppers and dollars spent online. These predictions are based on historical online spending trends from the eCommercePulse, which surveys about 35,000 Internet users monthly on their online shopping and buying habits. The survey measures how many dollars are spent across 13 categories: auctions, books, music, video, clothing, computer hardware, computer software, electronics, fitness/sports equipment, flowers/gifts/cards, health/beauty, home/garden, and toys. ▲

Money Spent Online During The Holiday Season

2000
$8.9 billion

2001
$9.9 billion
(projected)
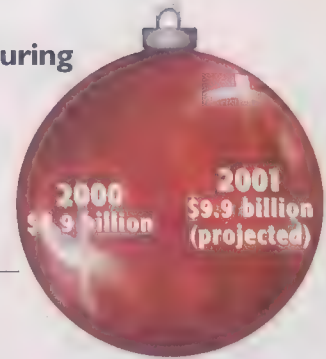
Online Shoppers In December

106 million (projected)

85 million

The Answers Have It

Landing an interview for a highly coveted job is only the first of several key steps on the road to being hired. Your resume and references may be in order, your technical certifications impressive, and your manner confident, but if you do or say the wrong thing during an interview, you can ruin your chance to get the job.

Case in point: Business etiquette consultant and author Barbara Pachter of Pachter & Associates tells the story of an interviewee who answered her ringing cell phone during the middle of a job interview. The interviewee then proceeded to yell into the phone at her kids on the other line. After hanging up, the woman assured the interviewer that such an incident wouldn't have happened if she were at work. Not surprisingly, the interviewer ended the interview, and the woman didn't get the job.

That's an obvious interview faux pas. How good are you at recognizing other no-nos? The Monster Interview Center at Monster.com (http://interview .monster.com/virtualinterview /tech) offers a Technology Virtual Interview that leads you through several questions a tech job applicant is likely to have to field. After selecting your answer and clicking the Results button, you'll see whether your answer was right or wrong. If you answered wrong, Monster.com will tell you which answer would have been better and why.

One question asks, "Why did your leave your last position?" Of the three possible answers, the one in which the interviewee mentions being laid off and blames the company for poor management is the worst choice. "Do not ever bad mouth being laid off or being rejected. That is projecting an attitude," says Carole Martin, author of the Monster.com Virtual Interview and owner of The Interview Coach, a consulting agency in Encinitas, Calif. "Employers are interviewing you because they are looking for solutions. If they get a clue that you are going to be a problem, they are going to say, 'next!'."

Especially if you yell into your cell phone. ▲

by Alex St. John

What Does Anybody Need A 1GHz Computer For?

Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent, a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

The PC industry is in a hard way these days. There isn't a very good answer to the question, "Why do I need a new computer?" A 90MHz Pentium provided all the horsepower you ever needed to run a browser, e-mail, Microsoft Office, etc.

The Internet helped create the problem because suddenly your computer's most compelling use became text viewing, editing, and delivery again. Delivering anything more interesting or computationally demanding over a modem or even broadband is like trying to suck a coconut through a straw.

Here are the main reasons why I think most people buy a new computer:

1) Everybody out there writing new software has a computer two years newer than yours. They don't bother to optimize that software for your old computer, so it runs like garbage on your machine, even though it's a text-processing program. Hey, they know that if your computer is more than three years old, you don't buy software anyway!

2) Your old Windows installation gradually decayed into complete instability and you can't find your original Windows install disk anymore to purge it, nor do you relish finding all the newest drivers and all your other software CDs to get a fresh install again.

3) Microsoft shipped a new OS and you're probably missing out on some new exciting feature nobody can really identify, but you'd hate to be the last one to have it. Dancing paperclips . . . come on, you know you want them!

4) That new Microsoft OS also helped itself to all your RAM, disk space, and CPU cycles to make the dancing paperclip look GREAT!

5) Games, games, and more games.

Games were the driving force behind consumer adoption of newer, faster personal computers, but with a wave of next-generation game consoles entering the market, many PC game developers have moved their focus to the console. People just don't put $1000 personal computers in the living room, but they'll buy an additional $300 dedicated computer just to play games on.

Intel tries very hard to convince us that a faster CPU actually has some beneficial impact on our Internet experience. I'm on the Intel site as I write this, looking at the description for the 1.8GHz CPU's "NetBurst" bus architecture—as though it has something to do with making a network run faster. They also try to convince us that "video editing" is a killer application everybody needs.

The PC OEMs tell us that the exciting new feature of their PCs is that they ship with a NEW Microsoft OS. I don't know about you, but I think I'd get a lot more value from a new PC if it shipped with an OLD OS that I knew wasn't going to break anything I was used to having.

The trouble is that our computers have outgrown us. They've become so powerful that nothing in our current software experience demands new ones.

> **Games are a new media type just like television and print; it is just a matter of time before they mature to equivalent relevance in everybody's lives.**

I think that will change quickly, though. Games have always led the way in computing innovation for consumers. The new consoles are nice, but they are all children's toys compared to a modern PC. Out-there companies like Sony's Verant are building games on a new scale that surpasses the ambitions of any game ever made. These games are vast in scope and infinitely demanding of computer power and communications support. Some say that these games have a narrow market of hard-core gamers. I doubt this; I believe that greater realism and interaction between real people will increase and broaden the popularity of this genre of games over time. I don't believe this demand for realism and greater connectivity will wane until everybody owns a personal holodeck one day. Games are a new media type just like television and print; it is just a matter of time before they mature to equivalent relevance in everybody's lives.

Game developers may struggle to get the formula right, but they will eventually. Then the question will not be "What does anybody need a 1GHz computer for?" but rather, "Why does anybody need a game console that isn't a PC?" ■

Speak your thoughts to TheSaint@cpumag.com.

EXTREME HARDWARE

These Gizmos Don't Sing It, They Bring It

Not every piece of "extreme" hardware we look at costs eighteen grand like IBM's mammoth 22.2-inch flat-panel monitor. Some freaky gizmos are relatively afford-able, in fact. Whether your idea of extreme means watching DVDs in your car or browsing the Web using your digital camera, we have your mojo right here.

by Marty Sems

Trek ThumbDrive Touch

Key chain-ready USB flash memory devices are useful enough to make you forget all about floppy drives. Of course, thumb-sized gadgets like these are also prime pickings for five-finger discounts, if you take my meaning. At least if your Trek ThumbDrive Secure ($39 for 16MB; www.thumbdrive.com) is stolen, no one will be able to get to your files without your password. Its even more secure sibling, the ThumbDrive Touch, may be available by the time you read this. The Touch is the first USB flash memory device I've seen sporting a biometric pad that requires your thumbprint for file access. At this writing, Trek plans to sell 32MB to 128MB ThumbDrive Touches for $99 to $299.

IBM T221 22.2IN LCD 22.2V BL

It's 2001. IBM has a monolithic flat-panel monitor (www.ibm.com/products). All we need now is Keir Dullea in our IT department reprogramming the fileserver the old-fashioned way. Put on your three-dollar classicalCD with Richard Strauss music on it. Your PC is about to evolve. Plunk down a mere $17,999 and a new T221 22.2-inch wide-screen display with a 16:10 aspect ratio is yours. That's a 3,840 x 2,400 resolution (9.2 million pixels if you're counting), more than enough resolution to give your puny 3-D card with DVI (Digital Visual Interface) support feelings of inadequacy and shame. All these pixels are at your disposal and the thing's not even 8 inches thick. Go ape.

Panasonic PKG-DVD1

Have a car so nice that you never want to leave it? Tilt the seat back, goose your subwoofers, and pop in your "Leon" DVD. Panasonic (www.panasonic .com/electronics) makes both automotive DVD/CD players and corresponding active matrix flat-panel monitors, so it wasn't a big hop for the company to combine the two into a $1,599.99 consumer package called the PKG-DVD1. If you're an intrepid do-it-yourselfer, you can install the trick flip-down 6.8-inch CY-VMX6800 display on your car's headliner between the seats and the separate CX-DV700 disc player wherever you'd normally mount a stereo. The PKG-DVD1 comes with a remote control, sepa-rate volume controls, and even wireless headphones. Use your brain, though. Don't wrap your fly ride around a guardrail just because you were teary-eyed at the sad part of "Snoopy, Come Home."

Ricoh RDC-i700

The Ricoh RDC-i700 seems like just another 3.34-megapixel digital camera with 3X optical zoom. And it can also grab video and record audio, yes, yes. But—and this is a pretty big "but"—it can also e-mail or FTP those photos and sound clips over the Web, among much else. Heck, you can even use the RDC-i700's 3.5-inch LCD as a Web browser. The screen is touch-sensitive and has a complementary stylus to mark up your photos. And how many cameras fax text like this one does? The RDC-i700 has Type II PC Card and CompactFlash storage slots that support Ethernet, modem, wireless, and other connections with the proper adapters. If you're still thinking, "What the hey?" we don't blame you. We can't do the RDC-i700 justice here, so check it out on Ricoh's site. It currently sells at www.ricohdirect.com for $1,299.99.

VAIO Slimtop Pen Tablet LX920

Graphic artists can benefit from digital tablet/monitors, such as Wacom's Cintiq ($1,899), by seeing what they're drawing on the same device. Sony goes one better by building an entire system around its own 15-inch flat-panel monitor/digital tablet. The idea behind the VAIO Slimtop Pen Tablet PCV-LX920 ($2,499.99) is to use an included stylus to draw on the pressure-sensitive screen, using included software such as Adobe's Photoshop Elements. The Pen Tablet is a decent compact PC in its own right, with an 8X/4X/32X CD-RW/8X DVD combo drive, built-in harman/kardon speakers, a 1GHz PIII, and a 60GB hard drive. Its connectivity includes 10/100 Ethernet, iLink (Sony's name for IEEE 1394), a PC Card slot, and of course, Memory Stick. Look for it at www.sonystyle.com.

CoolerGuys WindTunnel III

Extreme systems generate extreme heat. If your overclocked rig brings to mind a nuclear reactor with a few warped control rods, you need fannage. That's why CoolerGuys (www.coolerguys.com) sell modified cases such as the WindTunnel III ($159.95 and up). If the WindTunnel's five big fans don't chill your chips, you're already violating the Kyoto agreement on global warming. Our WindTunnel III has a 350W, AMD/P4-ready power supply and a huge optional 120mm front fan (for a $248.90 price as configured). Its fit and finish is superb, and all interior edges are deburred or folded. The side panels aren't the easiest to remove, but the translucent hideaway front drive cover and toollessly removable 3.5-inch bay is nice. Don't forget that the best case in the world can't compensate for a crappy heat sink, so don't skimp on your love there.

Graphics & Design: Carrie Benes

CPU First Look

NVIDIA nForce

N VIDIA is peppering the industry with pixels. Its 3-D graphics line-up and the technology inside Xbox aren't trivial, but now they have something a little different: nForce. Dead serious and perhaps NVIDIA's most daring project yet, the nForce 420-D/220–D is an integrated chipset solution for the AMD platform. Now before you get your knickers in a twist giggling about another integrated "cheapset" and how nice a present it'd make for Granddad, listen up marines!

There is more innovation and technology in nForce than eight white papers will accommodate. nForce is split in two parts, the IGP (Integrated Graphics Processor) and the MCP (Media and Communications Processor). The IGP/Northbridge consists of an integrated 175MHz GeForce2 MX, TwinBank Memory Architecture, a DASP (Dynamic Adaptive Speculative Processor), and AMD's HyperTransport I/O bus interface. The on-board GeForce2 MX might well be the fastest available integrated graphics, which is great for Granddad, but not for gamers.

The TwinBank architecture on the IGP-128 sports two 64-bit SDR/DDR-SDRAM memory controllers. (IGP-64 with one 64-bit memory controller is also available.) The dual channel DDR-SDRAM memory interface gives the memory controller a 4.2GBps theoretical bandwidth peak, which is useful for getting performance out of that integrated video. The DASP and its eight-way set associated prefetch cache make use of the 2.1GBps of bandwidth left over (Athlon's FSB is limited to 2.1GBps) from the second DDR channel, as long as you don't plug a conventional 3-D card into the AGP slot. AMD's HyperTransport technology connects NVIDIA's IGP and MCP together.

The Southbridge (MCP) also raises the bar and sports a fancy 5.1 Dolby Digital-capable APU (Audio Processing Unit), a complete communications suite, StreamThru technology (which gives lower pings), and the HyperTransport bus. The APU (same as in Xbox) is rather smart and capable of encoding Dolby Digital 5.1 audio streams on the fly in hardware, unlike Creative's Audigy, which comes with a conventional Dolby Digital decoder. Impressively, the APU supports both Creative's EAX and Sensaura's 3-D positional sound. Throw

in the fact that the APU is a DX8-class audio chip that utilizes the CPU less than an SBLive!; not only are you saving the cost of a sound card, but you've got something quite compelling. The communications suite consists of telephony and HomePNA 1.0/2.0 phone line networking functions, dual USB 1.1 controllers, MC'97, and 10/100Base-T Ethernet/Fast Ethernet. In addition, nForce supports up to five PCI slots, an AGP slot, and an AC'97 interface, and it offers ATA-33/66/100 (but not the upcoming -133).

I sank my teeth into a preview reference board with BETA Bios. It was stable, which is always a good sign when hardware isn't yet final. Drivers weren't final either, hence EAX wasn't working. Benchmarks I ran on WinXP with an Athlon 1800+ XP showed nForce tied with, and in some cases slightly ahead of, the VIA KT266A platform when using a GeForce3, not the on-board video. SYSmark 2001 had the nForce in the lead, KT266A second, and AMD's 760 brought up the rear. The same trend was true with SiSoft Sandra's memory benchmark, Max Payne, and Serious Sam. Quake III was a draw between nForce and KT266A. More good news comes from NVIDIA's unified driver (a 4MB compressed file), which makes it easy on Granddad.

Thus, NVIDIA's first attempt at a chipset is outstanding. As a mesh of complex technology, it smells good. Now it's up to OEMs to take this bar-raising (hence the four CPUs rating) chipset and make something extra special. According to the rumor mill, by the time you read this, OEMs such as MSI and Asus "should" have various configurations on sale for around $150 to $200. Because performance is so close between the KT266A and nForce, price should become the key factor, unless you aren't a gamer and therefore covet the added savings the on-board video brings. The next few months will show just what chipset is being offered most attractively, but NVIDIA won't have it as easy as it does in the graphics space. Taiwan's finest, VIA, SiS, and ALi, are set to offer some stiff competition in response.

Being an enthusiast, integrated chipsets used to go down like a stale Chalupa. But this time it's different. There's no i740 graphics chip or cheapskate on-board Vibra sound to choke on, and if, in the near future, a Geforce3-integrated nForce arrives, I just might ask ol' Granddad to loan me his PC. ▲

by Alex "Sharky" Ross

nForce

Approximately $150 to $200 for nForce-based motherboards
NVIDIA
(408) 486-2000
www.nvidia.com

Sony Cyber-shot DSC-F707

Consumers keep getting more megapixels for less money. At $1,000, you'd expect the Sony DSC-F707 to be a 4-megapixel camera, but it actually packs 5 megapixels into its frame.

The 16MB Memory Stick the camera bundles stores six (highest quality) to 240 (lowest quality) JPEGs. GIF and TIFF formats are also available. The InfoLITHIUM NP-FM50 battery pack is ready to go after 150 minutes in the built-in charger. The camera displays the charge level on the LCD graphically and in minutes remaining.

Surprisingly, this camera handles easier than others with smaller lenses. Cupping the gigantic barrel lens in my left palm, I was able to fully support the camera's weight. I only needed my right hand to operate controls. In addition, the lens tilts 77 degrees up and 36 degrees down for good flexibility in framing shots.

After using the camera, I discarded my last bit of prejudice against scrawny pop-up flashes. All pictures were excellent, especially indoor shots, which were well lit and contained true-to-life colors. A hot shoe is also available for mounting an external flash.

I can't begin to list all the camera's advanced features, but they left me amazed. Most notable are the Nightframing and Nightshot modes. A combination of IR technology, Hologram AF, and TTL preflash metering enables the DSC-F707 to take full-color photos in the dark. I took several pictures inside a dark closet, and the images looked like those taken with the lights on. E-MAIL mode is also handy for simultaneously capturing one at a resolution you choose and one at 640 x 480. The VOICE mode lets you record audio to still images.

Though the DSC-F707 is pricey, I have no qualms about recommending it. With its numerous features, great image quality, and 5 megapixels, the DSC-F707 is a steal for $1,000. ▲

by Kylee Dickey

Cyber-shot DSC-F707
$1,000
Sony
(800) 352-7669
(408) 432-1600
www.sonystyle.com/digitalimaging

Toshiba PDR-M11

The digital camera market is rife with products in the sub-$300 range, which means there are plenty of cameras from which to choose with significantly different features but similar limitations. The Toshiba PDR-M11 proves that some cameras in this price range are functional but some still have a ways to go before they'll usurp traditional 35mm cameras at the same price level.

I previously reviewed Toshiba's PDR-M71 and PDR-M81 and loved each for its user-friendliness and smashing hardware. Although the M11 is easy to use, it doesn't pack much punch with a 1.3-megapixel CCD (1,280 x 960 maximum resolution), 2X digital zoom, and 4MB SmartMedia flash card. The F2.8/F8.0, f=6.67mm lens (equivalent to 52mm on a 35mm camera) focuses from 39.4 inches to infinity but lacks a macro mode.

On the bright side, the M11 has some of the features I like best, including dedicated controls to quickly manipulate photo quality, photo deletion, the flash, and the timer. Although the menu system is bland to the point of being antiseptic, it is easy to navigate via the 1.8-inch LCD monitor.

Taking these factors into consideration, the deciding factor is certainly picture quality. To that end, the M11 comes up a little short. Even in its highest resolution mode (at which you can store five shots), photos weren't especially clear, with most appearing overly dark. These problems are correctable via the white balance and exposure compensation settings, but most people interested in a camera priced this low won't want to fuss with these options.

Add in that the camera's case and controls are less than sturdy (you can't remove the flash card without opening the battery compartment), and the M11 is a work in progress. I'm a fan of extremes: Either buy a truly cheap digital camera, or spend another hundred bucks or so and get a camera with capabilities that will last you several years. ▲

by Nathan Chandler
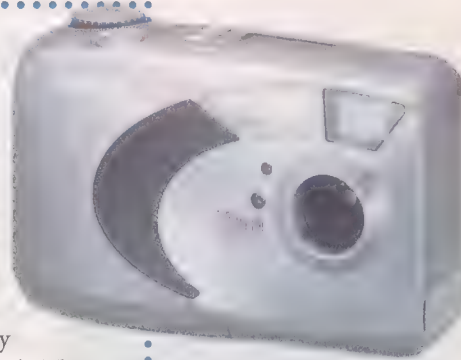
PDR-M11
$249
Toshiba
(800) 550-8674
(949) 583-3000
www.toshiba.com

Nikon Coolpix 775

Most midlevel consumer cameras blend two key ingredients: advanced hardware and lots of point-and-click features. The idea is to give amateur photographers the ability to capture great photos without fuss. Nikon's Coolpix 775 certainly fits that billing.

The 775 is a 2.14-megapixel camera capable of creating images at a resolution of 1,600 x 1,200. It's equipped with a 3X optical zoom (digital zoom 2.5X) and a 5.8-17.4mm Nikkor lens that's equivalent to 38-115mm in 35mm camera format. The camera is powered by a rechargeable Li-Ion battery pack that takes about two hours to fully charge.

Unlike most point-and-shoot cameras, this one comes with seven scene modes, including Night Portrait and Sunset, along with the usual range of preset modes. Folks who actually know how to use a camera may find this a bit much.

The few manual controls are limited to options such as exposure compensation and white balance. On the plus side, a movie mode lets you snag soundless, 15-second clips.

Photo quality is acceptable for a camera of this price. The Auto mode may not please all novice picture takers, though. I noticed that my shots taken on a cloudy day were overly dark, a problem that some minor manual adjustments would have cleared up. The included 8MB Compact-Flash card isn't big enough to handle more than eight photos taken in Fine mode, so you'll likely want to upgrade to at least 16MB before a trip.

Epson's Print Image Matching technology is included on the 775. That means you'll want to invest in a printer with like capabilities, and your prints will be all the better for it.

When you consider this camera's ease of use and the fun you'll have playing with all its features, it's easy to see this Nikon is a solid hit. ▲

by Nathan Chandler

Coolpix 775
$400
Nikon
(800) 526-4566
(516) 547-4200
www.nikonusa.com

Creative Labs Sound Blaster Audigy Platinum

Creative Labs is a PC audio juggernaut, and based on my experience with the new Sound Blaster Audigy Platinum sound card (which includes a Sound Blaster Audigy drive), that's not going to change. The Audigy is a great sound card that will turn your PC into a home audio studio.

The Sound Blaster Audigy Platinum sound card uses the new Audigy audio processor and has a high signal-to-noise ratio of 100dB (decibels). This is the first sound card I've seen with a signal-to-noise ratio in the triple digits. Its hardware polyphony of 64 voices is typical for most sound cards.

The Audigy is compatible with Microsoft's DirectSound and DirectSound3D APIs. It uses Creative Lab's proprietary EAX audio effects and the new EAX Advanced HD technology, which adds more sound effects and improves the card's 3-D sound. The card is compatible with Windows98/Me/NT 4.0/2000 and works with Dolby Digital 5.1 speakers.

The Audigy drive installs in a drive bay in your PC and has several inputs for various devices, such as CD players or other stereo equipment. There is one IEEE 1394 input in the drive and another on the sound card for high-speed peripherals.

I played some CD audio tracks using the Audigy Platinum sound card, followed by a few rounds of Half-Life. I was impressed with the overall audio quality this card provided. The CD tracks sounded excellent. The bass hammered through the subwoofer, and I didn't notice any distortion, even at higher volumes. Half-Life also sounded superb. The 3-D audio effects and ambient sounds in the game sounded better than ever. As with the CD tracks, the bass rumbled beautifully.

The Sound Blaster Audigy Platinum is great for gamers and even better for users who like to create their own audio tracks. Creative offers four Audigy sound card kits, starting at $99. ▲

by Michael Sweet

Sound Blaster Audigy Platinum
$199.99
Creative Labs
(800) 998-1000
(408) 428-6600
www.creativelabs.com

CPU Ranking: ⬜ 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Canon S300

Some wannabe computer geeks refer to sub-$100 printers as "toys." Give me a break. Cheap inkjets create eye-jolting photos and decent-quality text for pennies per page. But some folks just can't get past the idea that hardware so inexpensive is really that impressive. The Canon S300 is just another nail in the coffin of these faulty assumptions.

For 99 bucks, you get a printer crammed with 2,400 x 1,200 resolution and teensy 5-picoliter-sized droplets. No, this thing doesn't have a parallel port—but let's get with the program here, folks; it's called YOU-ESS-BEE.

The S300's crowning achievement is its quick-footed photo printing. Full-page (8.5- x 11-inch) photos are done in just three minutes on plain paper. Tack on another minute and a half for glossy-paper images. Colors, predictably, aren't perfect. If you're paying attention, skeptics, here's the big limitation of the S300: Photos have too much red in them.

That goes for cartoonish graphics, as well, though colors are smoother and still more accurate than Lexmark's cheap printers. My six-page mix of graphics and text printed at a decent clip, too (1.43ppm).

And speaking of text, this Canon could school a few higher-priced inkjets. Draft-mode text has some stairstepping and visible ink satellites; that said, this is still some of the most consistent text I've seen from an inkjet. It prints fast, too, at about 6ppm.

My last gripe about the S300 is that black ink is pricey: 5.4 cents per page. Color is more reasonable at about 10 cents per page.

Yes, Canon stripped down this printer a little to hit the $99 price point. But this printer is not a toy. Ink costs will bite if you start using this printer more than occasionally, so it's best reserved for those with intermittent printing needs. ▲

by Nathan Chandler

S300
$99
Canon
(800) 652-2666
(714) 438-3000
www.usa.canon.com

Samsung ML-6060

Samsung hopes its ML-6060's fast print times and midrange price will catch your eye. This monochrome laser has a 66MHz RISC processor and comes with 4MB of installed RAM, which you can beef up to 68MB. For $199, you can get a 100Base-T Ethernet card for the printer; it comes with both parallel and USB ports.

A 550-sheet paper cassette tray and a 100-page multimedia tray come standard. If you need room to store 1,200 sheets of paper, you can purchase a second 550-sheet tray for $239. Replacement toner cartridges are reasonably priced at $99 for a 6,000-page life.

Demonstrating Samsung's promise of speed, the first page of our test text file appeared in 0:15 (minutes:seconds). All 10 pages printed at a rate of 10.2ppm. This printer barely blinked when I tossed graphics at it, printing the first page of a text-and-graphics file in 0:16. The remaining five pages followed in 0:39. Most similarly priced printers can't match the 0:15 first-page-out time of the three-page PowerPoint document we printed next. The entire document printed at 7.2ppm, a rate comparable to other lasers under $500.

At the printer's lowest resolution of 300dpi, I noticed some fonts had broken edges, which is unusual for a laser printer. Text was dark and easy to read but a little fuzzy. Switching to the 600dpi default setting produced some of the clearest, boldest fonts I've seen from a printer at this price. The only exception is that the printer made no attempt to print a line of miniscule size-one font.

Another problem I noticed was that small details such as the wrinkles in a white shirt were lost in high-resolution graphics (printed at the maximum resolution of 1,200dpi). Also, both images were cut at the top and bottom of the page. To Samsung's credit, those problems weren't present in charts or clip art, making this an excellent printer for text and reports.

The ML-6060's speed, flexible paper-handling, and option for network capabilities ensure that this Samsung will find a place in many homes and small businesses. If you need a versatile printer for text, this one is definitely worth a look. ▲

by Kylee Dickey
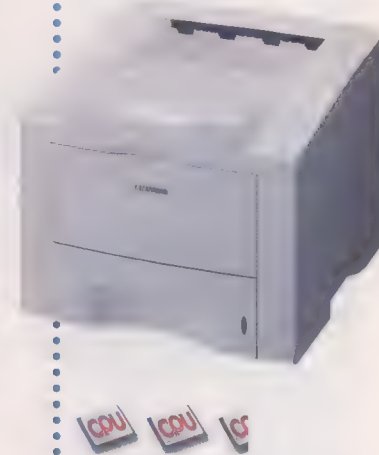
Samsung ML-6060
$449.99
Samsung
(800) 726-7864
(201) 229-4000
www.samsungusa.com

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Falcon Northwest Mach V

Mach V

$3,895
Falcon Northwest
(888) 325-2661
(541) 552-1140
www.falcon-nw.com/site.htm

Processor:
AMD Athlon 1800+

RAM:
512MB DDR-SDRAM

Hard Drive:
80GB (two 40GB) SCSI RAID

Optical Drive:
Toshiba 16X DVD; Plextor 24X/10X/40X

Connectivity: D-Link 10/100 Ethernet adapter

Graphics Accelerator:
NVIDIA GeForce3 Ti 500

Monitor:
ViewSonic G90f

Chassis: Extended ATX case

System Use:
Entertainment

Final Word: I'm dizzy.

There are powerful PCs, and then there are Falcon Northwest systems. Falcon Northwest specializes in high-performance PCs for the most serious of gamers. You can customize nearly every aspect of the system, from the motherboard to the network adapter, and Falcon Northwest goes to great lengths to offer the latest and best hardware available. I had the company whip up a dandy PC for me.

Specifications. The Mach V I reviewed runs on Microsoft's new WinXP Professional operating system, although the home version of XP is also available. The system uses AMD's new Athlon 1800+ processor and has 512MB of DDR-SDRAM under the hood. You can expand that to 1GB if you want.

Falcon Northwest included an NVIDIA GeForce3 Ti 500 graphics card in the Mach V, which is simply the best video card available for gamers. It has 64MB of DDR-SDRAM and accelerates 3-D graphics better than any video card I've seen. The system came with a 19-inch ViewSonic G90f monitor.

The Mach V's audio configuration is just as good as the video configuration. It includes Creative Lab's Sound Blaster Audigy sound card and a set of Klipsch's superior ProMedia 4.1 speakers. Falcon Northwest also offers the Klipsch ProMedia 5.1 speakers.

The system's storage hardware is excellent. It includes a 16X Toshiba DVD, which is not uncommon on new PCs anymore. However, the Plextor 24X/10X/40X CD-RW drive is about as fast as it gets. Falcon Northwest outfitted my Mach V with a pair of IBM 40GB hard drives hooked up to a SCSI RAID controller for extra performance.

Design. I never thought I'd say this about a PC, but one of its best features is the case. It's a Cooler Master ATC-110 Extended ATX aluminum case, and it looks simply gorgeous. There's enough room to bake a country ham in it, which of course I wouldn't do until it gets closer to Christmas. Besides being the coolest case I've ever seen, it's also the *coolest* case I've ever seen, as in, this system won't overheat. The aluminum case absorbs heat and draws it out of the

system. It also has three exhaust fans to keep the air flowing. I have absolutely no need for a new computer case, but I'm tempted to buy a Cooler Master ATC-110 just so I can say I have one.

The Mach V has only a couple of spare slots but has drive bays aplenty. There are five PCI slots, although the sound card, RAID controller card, and network adapter occupy three of the slots. There are eight 3.5-inch drive bays, of which four are available. There are also four 5.25-inch drives; two are open.

The Mach V has a decent selection of ports. It has the usual two serial ports and one parallel port. There are two USB ports, and one IEEE 1394 port on the Audigy sound card. I would have expected a system like this to have more USB and IEEE 1394 ports, but it's not that big of a deal.

Performance. This Mach V is a genuinely cutting-edge machine, so I expected big numbers from our benchmark tests. The system's Overall SYSmark2001 score of 189 is well above average. The Office Productivity score of 192 is the highest I've seen, and the Internet Content Creation score of 187 is outstanding.

We couldn't run the Video2000 benchmark on this system because the benchmark isn't compatible with WinXP. A patch for WinXP is supposed to be in development, however. We could run the 3DMark2001 benchmark, and the Mach V's score blew me away. It tallied up 7,843 total points, shattering all previous records.

I finished testing this system by watching scenes from "U-571" on DVD, playing a few rounds of Quake III, and listening to some audio tracks. The Mach V excelled at every task. I maxed out Quake III's resolution to 1,600 x 1,200, and the game ran perfectly. Every detail looked fantastic.

The PC's audio was exceptional, as well. The Klipsch subwoofer dishes out a lot of power, and I could feel it in my chair when watching the DVD and playing Quake III. The audio tracks also sounded good, of course.

Final word. I love the Mach V. If the guys at Falcon Northwest want it back, they're going to have to come down here and pry it from my fingers. The Mach V is a very expensive machine, but if you want the best, this is it. ▲

by Michael Sweet

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

AMD Athlon XP 1900+

The new fastest processor in town is AMD's Athlon XP 1900+. When run through the nomenclature-marketing-tosh filter, that equates to 1.6GHz, thanks to a 12x multiplier and a 133MHz FSB. Perhaps this release will appease the OEMs that don't know their IPC from their MHz, but all you need to know is the 1900+ is 67MHz faster (about 4% in benchmarks) than the 1.53GHz 1800+. Not exactly a Carl Lewis leap, but it does bridge the gap with Intel's P4 2GHz being $150 pricier.

The 1900+ chip retains the same "Quanti-Speed" architecture as the 1800+ and looks identical. Only when you investigate the core's small stepping numbers and letters do you spot any difference. Initial overclocking results were promising. The option is there if you fill the indented ridge between the L1 bridges with fast-drying epoxy and connect them with the "pencil trick." 1800+ owners can also overclock to 1.6GHz and once again own the fastest chip on the block. The whole Athlon XP line is getting a price slashing to ease the 1900+'s introduction, making the 1800+, now about $50 cheaper, the best bang for your buck.

Performance has now been enhanced for all Athlon XPs when coupled with VIA's new KT266A chipset (check it out in the review below), which AMD is encouraging by the phasing out of the AMD 760. The entire system was incredibly stable and quicker than a ray of light in WinXP Pro. So the CPU and platform performance crowns still belong to AMD and VIA, respectively. Intel's 0.13-micron P4 "Northwood" is still slated for a mid-Q1 2002 launch, so I'll see you again next month. I'll bring the CPUs and the benchmarks; you bring an open mind. ▲

by Alex "Sharky" Ross

AMD Athlon XP 1900+ Benchmarks			
	XP 1900+	XP 1800+	P4 2GHz
Quake III	242	237	240
Max Payne	110	108	101
SYSmark 2001	199*	196*	189
*with AMD patch			

Tests conducted on Windows XP Pro

Athlon XP 1900+
Approximately $265
AMD
(408) 749-3060
(800) 538-8450
www.amd.com

VIA Apollo KT266A

The Athlon XP is out, so AMD owners now have more platform choices than a Great White during the Northern California salmon run. VIA's performance crown has been challenged by SiS, NVIDIA, Ali, and AMD chipsets, pushing VIA into high gear to update the KT266 chipset to the Apollo KT266A.

The KT266A is still part of the V-MAP (VIA Modular Architecture Platform) family, allowing OEMs to serve different market segments on a single, unified platform design, but the KT266A sports a new 552-pin VT8366A DDR North Bridge and 376-pin VT8233/C V-Link South Bridge (also found on the KT266). Deeper internal buffers and an improved memory controller have made a performance boost possible. VIA carried over the South Bridge from the KT266, but an improved South Bridge featuring ATA133 support is on the horizon.

KT266A's additional enhancements include tightened timings on the S2K frontside bus, deeper instruction data queuing, and the ability to burst up to eight (KT266 had four) Quad Words per clock cycle. Improved timings result in faster transfer rates between the frontside bus and memory bus. Deepened data queues allow faster and more efficient access to buffered data. Comparing the KT266A to the older KT266 and AMD 760 chipsets with an Athlon XP 1800+ yielded an obvious trend. The KT266A is about 10% faster in Quake III and about 4% faster in SYSmark, making it the new performance leader when it comes to chipsets for the Athlon/Duron.

The KT266A supports DDR PC1600 and PC2100, as well as SDR PC100 and PC133 memory, giving OEMs the choice of including both or either. So cost-conscious Duron users should be able to pick up inexpensive KT266A SDRAM solutions soon. High-performance KT266A DDR RAM-based boards are available from EPoX, MSI, and ASUS for roughly $180 and worth the money, for the time being. With NVIDIA's nForce and SiS' 745 chipsets looming, however, VIA's clear blue sky could turn cloudy in a jiffy. And I haven't even opened the can of Intel worms yet. ▲

by Alex "Sharky" Ross

Apollo KT266A
Approximately $180 for KT266A-based motherboards
VIA Technologies
(510) 683-3300
www.viatech.com

CPU Ranking: 0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect

HP Pavilion n5470

Processor: 1GHz Athlon 4

RAM: 256MB/512MB

Display: 15-inch TFT

Dimensions (inches): 13.46 x 10.92 x 1.65

Weight (pounds): 7.6

Hard Drive: 20GB

Optical Drive: DVD-ROM

Connectivity: Modem; Ethernet

Final Word: This is a desktop replacement intended primarily for consumers. Athlon 4 provides decent performance, but doesn't quite hold its own with 1GHz Pentium III-M processors. Video performance was a little disappointing, but well worth the price tag.

Hewlett-Packard's Pavilion Series has traditionally been targeted at the consumer market. The emphasis here is on value, and the latest Pavilion n5470 provides plenty. It features AMD's new Athlon 4 mobile processor. AMD has long been lagging behind Intel in terms of notebook performance, but the company hopes to close that gap with its Athlon 4.

Specifications. The n5470 comes with a 1GHz Athlon 4 processor. AMD claims the new processor consumes about 20% less power, and AMD's PowerNow! technology reduces power consumption further by slowing the processor when extra horsepower isn't needed. The speedy processor combined with 256MB of SDRAM didn't blow away the competition, but it did hold its own. (I'll get to performance in a bit.) Although the Athlon 4 provides decent performance, it doesn't appear able to hang with Intel's new Pentium III-M processors.

The 20GB hard drive is augmented by a CD-RW/DVD drive and a diskette drive. Thanks to the three-spindle design, all components are integrated into the notebook and provide plenty of versatility. In terms of communications, the n5470 features a V.90 modem for run-of-the-mill dial-up connections and an integrated 10/100 Ethernet port for more enticing broadband and LAN connections. Dual PC Card slots accept two Type I or Type II PC Cards or one larger Type III card. An 11.1-volt Li-Ion battery provides power to everything, including the gigantic 15-inch display and Trident Cyberblade XP video card with 8MB of video RAM.

Design. The n5470 manages to avoid the boxy look associated with other desktop replacements. Where it can, HP has used smoothed, rounded edges to make the notebook look a little sleeker and spottier. But don't let the optical illusion fool you. The n5470 is a full-figured desktop replacement weighing a hefty 7.6 pounds. Of course, that just means there's more of the n5470 to love.

The 15-inch display is attractive. It's bright and vivid with a good viewing angle, making this notebook ideal for presentations. The n5470's presentation features are further enhanced by a composite video out for connecting the notebook to a television. A traditional VGA port lets you connect the n5470 to an external monitor or a digital projector.

The display is even better as a movie screen. The n5470's display provides excellent color and plenty of space for DVD movies. While trying to enjoy a movie, however, we noticed occasional jerks and brief pauses.

The speakers suffer the same fate as most notebook speakers. Poor low-frequency reproduction provides a very thin, tinny sound. We did like that HP placed its headphone jack in the front of the unit. You don't have to feel your way around the back to find the audio out jack for your headphones.

The n5470 has an excellent keyboard. Key spacing was generous and roomy. Cursor control keys (such as PAGE UP) occupy the upper-right corner of the keyboard where they are out of the way. Cursor keys are in the customary inverted T and slightly separated from the rest of the keyboard. Each key had a good range of motion and excellent firmness.

Performance. The n5470's AMD processor held its own against other 1GHz Intel systems, but Video 2000 scores were a little disappointing. SYSmark2000 scores of 181 in Internet Content Creation and 146 in Office Productivity provided an Overall score of 160. This doesn't exactly kick the Pentium III to the curb, but the Athlon 4's performance seems closer to hero than zero.

On the other hand, the Video Mark overall score was a disappointing 1731. While this is by no means the worst multimedia performance I've seen, it is enough to explain the occasional skips and jerks in DVD playback. Perhaps a little video RAM could've improved multimedia capabilities.

Final word. Even though its multimedia performance isn't the best, the n5470 is still a competitively priced system that will make many notebook owners happy. The large display is sure to be a crowd pleaser, and overall performance should keep most users productive. ▲

by Chad Denton

CPU Ranking: 0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect

Compaq Evo N150

Compaq's Evo N150 is the company's latest low-end notebook. As is the case with most low-end systems, Compaq cut out a number of features to deliver the Evo N150 for less than $1,500, leaving little to differentiate it from competitors' offerings.

Specifications. The 700MHz Celeron processor and 64MB of RAM (upgradeable to 320MB) aren't going to give you breakneck performance, but they help keep the cost of the notebook down. The Cyberblade i1 video card won't help performance numbers either. It uses 8MB of system memory instead of dedicated video memory. Again, this saves space and cost, but it does limit performance. The 10GB hard drive is on a par with other top systems in the Evo's price range. Instead of a more compelling optical drive option, such as DVD-ROM or CD-RW, Compaq went with a straight 24X CD-ROM drive. The CD-ROM drive is modular, so you can easily upgrade to more compelling options if you want.

On the up side, the Evo N150 features a generous 14.1-inch TFT display and both a modem for dial-up connections and an Ethernet port for broadband and LAN connections. And the Evo N150 has two Type II PC Card slots that let you use a single Type III PC Card. The Evo N150 also has an impressive list of peripheral ports, including two USB ports, a parallel port, and a 9-pin serial port. The SVGA out port lets you connect the Evo N150 to a standard CRT display.

Measuring 1.3 inches high x 12.2 inches wide x 9.8 inches deep and weighing just 5.9 pounds, the Evo N150 is one of the lighter notebooks in this price category, although not by a significant amount.

Design. The Evo N150 looks professional. The majority of the case is black plastic accented by a mostly silver lid. I didn't find the Evo flashy or trendy; it just looks sharp and professional. The case should do an adequate job of protecting the system and the LCD.

My biggest complaint about the speakers is Compaq chose to place them in the palm rest; when you type, your palms distort any sound from the speakers. I realize you need to place components where space allows in a notebook, but that doesn't mean I have to like it.

I did like the keyboard on the Evo N150. Keys are large with full-sized ENTER and BACKSPACE keys. Cursor control keys, such as PAGE UP and PAGE DOWN, are in the upper-right corner where you're not likely to accidentally press them. The keyboard is spacious, and the firmness of the individual keys is good. They provided a nice feel when typing.

I liked the Evo N150's display, as well. It was bright, crisp, and easy on the eyes. The 14.1-inch display is one of the larger displays available in this price range, but it's not the first time I've seen a 14.1-inch display on a sub-$1,500 notebook.

Performance. As I expected from the specifications, the Evo N150 didn't turn in very great performance numbers. I tend to see better performance in units with more than 64MB of RAM. Allowing for the 8MB of system memory the video card uses, the Evo only has 56MB of RAM available to the system. SYSmark2000 benchmarks were modest, with an 89 in Office Productivity, a 95 in Internet Content Creation, and a 92 Overall SYSmark2000 score. These numbers aren't horrible, but they are certainly on the low end of acceptable, even for this price range. We were unable to test the N150 using SYSmark2001. Repeated tests on this unit failed.

Video 2000 scores were also modest, but that's to be expected from video cards using shared system memory. The Evo N150 turned in a Video Marks score of 1149.

Final word. It's not that the Evo doesn't compare favorably to other models in its price range, it's that it doesn't really provide much we haven't seen before. The N150's benchmark numbers aren't that impressive, and it doesn't carry any features we haven't seen in other notebooks in this price range. The 800MHz Pentium III model costs just $200 more and may offer better performance. Increasing the system memory to at least 128MB of RAM may also provide an extra performance burst. There's no denying the system's affordable price, but shopping around will reveal similar models with better performance in the same price range. ▲

by **Chad Denton**

Evo N150

$1,299
Compaq
(800) 888-0220
(281) 370-0670
www.compaq.com

Features

Processor:
700MHz
Celeron

RAM:
64MB/320MB

Display:
14.1-inch TFT

**Weight
(pounds):** 5.9

**Dimensions
(inches):** 1.3 x
12.2 x 9.8

Hard Drive: 10GB

Optical Drive: CD-ROM

Connectivity: Modem;
Ethernet

Final Word: Performance scores were poor, but increasing the memory may provide a shot in the arm. Nonetheless, I think you can find a better deal if you shop around.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Logitech Cordless Freedom Optical

The Cordless Freedom Optical is Logitech's most stylish keyboard to date. It costs more than similar wireless keyboards, but not by much, and its unique features (especially its signal encryption and optical mouse) makes it stand out. Forget about infrared doom; this keyboard and mouse combo uses radio frequency, working from a distance as advertised.

The keys at the top are basically identical to those on Logitech's Internet Navigator keyboard. The hot keys provide one-touch access to e-mail (Outlook Express by default), finances, media player, and more, and buttons for previous/next track, play/pause, stop, and mute. Logitech does replace the left-hand application switcher with two new buttons (a Go button now provides quick Web site access and a Back button, well, takes you back a page), and the volume control is now a dial instead of a button.

The devices are easy to install using one USB or two PS/2 ports and run on Windows 98/NT/2000/Me. Cables and batteries are included, as is iTouch software, which takes a bit longer than comparable software to install. If you don't like the default hot key links, click the iTouch Configuration icon to replace the presets with more useful functions.

If you recently upgraded to a mouse with a scroll wheel, give it to the Salvation Army. With the Cordless Freedom Optical package you get two scroll wheels: one on the optical mouse, and one on the left-hand side of the keyboard. As long as you're right-handed, this greatly reduces hand stress from repetitive pointing and clicking.

If the keyboard's black-and-silver casing and Zero-Degree Tilt (flat) design aren't enticing enough, just think about never having to clean a mouse ball again. For cutting-edge comfort, the Cordless Freedom Optical is where it's at. ▲

by Cal Clinchard

Cordless Freedom Optical
$99.95
Logitech
(800) 231-7717
(510) 795-8500
www.logitech.com

Memorex RF5000 Wireless Keyboard & Mouse

Price-wise, the RF5000 Wireless Keyboard & Mouse from Memorex sits at $79.99, smack in the middle of most other wireless keyboard-and-mouse combos available today. Most cost between $50 and $100, but there are high-performance models out there for more than $200. I found the RF5000 to be average in its features; not great, but not bad, and therefore priced right.

The RF5000 performed nicely, accepting every keyboard input and mouse movement regardless of where, on or near my desk, I used them. The advertised range for operating the keyboard or mouse in relation to the receiver is 4.92 feet, which seems about accurate to me (I didn't get my ruler to make sure about that last .08 foot).

Like most wireless keyboards, this one uses radio signals and not infrared. This means you can stack up just about anything between the keyboard and the receiver, as long as the impediment isn't an active monitor, which thwarts the signal.

The RF5000 came with all the necessary batteries and cables, and it was incredibly easy to install, so there was little delay between opening the box and using the keyboard and mouse. The combo works on systems with Windows 9x/NT4/2000/Me. I installed it on a system with Windows XP with zero problems.

The added buttons on the keyboard are handy for Web browsing, but other than that the keyboard is bare bones. And unless you're using Microsoft's Internet Explorer 5.0 or greater, you're out of luck using them. The added buttons, located along the top of the keyboard, provide quick access for Back, Forward, Stop Loading, Home, Search, and Favorites. Two more buttons let you launch your e-mail program (Outlook is the default) and put your PC in sleep mode.

The keys don't have an exceptionally solid feel, but they're light to the touch and appropriately responsive. The mouse is pretty standard, but includes a nice wheel for scrolling. If you want wireless on a budget, the RF5000 is the way to go. ▲

by Cal Clinchard

**RF5000 Wireless
Keyboard & Mouse**
$79.99
Memorex
(562) 906-2800
www.memorex.com

CPU Ranking: ◯ 0 = Absolutely Worthless ▢▢▢ 2.5 = Absolutely Average ▢▢▢▢▢ 5 = Absolutely Perfect
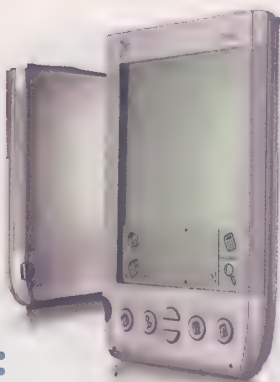
Handspring Visor Pro

Handspring's original Visor is beginning to show its age. The original release is running outdated software and its processor is quickly becoming equally outdated. The Handspring Visor Pro is one of two new models designed to update the aging Visor and Visor Deluxe.

The Visor Pro's 33MHz Dragonball processor is about twice as fast as the 16MHz Dragonball that shipped with the original Visor Deluxe. The Visor Platinum offers the same 33MHz Dragonball processor, but the Platinum's Palm OS 3.5.2H software is a couple of revisions behind the Palm OS 3.5.2H3 software in the Visor Pro. Two main features in the latest OS are support for silent alarms and the Fast Lookup feature in the Address Book app. Fast Lookup lets you find contact information without removing the stylus, and the silent alarm keeps you on track without disturbing others. The Visor Pro includes a green LED light in the right corner. The LED blinks when the silent alarm goes off. The Visor Pro does not include a vibrating alarm.

Another addition to the Visor Pro is a rechargeable Li-Ion battery. Whether you prefer Li-Ion depends on how you use your PDA. Some travelers prefer easily replaceable, widely available AAA batteries to rechargeables that require a separate charger. Personally, I appreciate not having to replace the batteries every month or so. Handspring claims the Visor Pro's battery life should last for about two weeks of standard usage. What Handspring considers standard usage and what you do may vary.

The most significant improvement of the Visor Pro is its 16MB of RAM. This is more than twice the amount of other high-end Palms and is the first Palm OS device to break through the 8MB memory limitation. Power users who want to keep extensive databases or other large amounts of information will enjoy the extra RAM. Aside from the increased RAM, there's nothing too thrilling about the Visor Pro. ▲

by Chad Denton
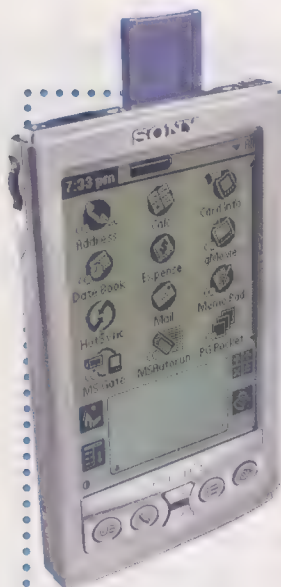
Visor Pro
$299
Handspring
(888) 565-9393
(650) 230-5000
www.handspring.com

Sony CLIE PEG-S320

Perhaps no Palm OS licensee has pushed the Palm OS to its limits, and in many cases beyond, than Sony, which has tweaked the OS to add support for digital music and higher-resolution displays. The CLIE PEG-S320 eases off the throttle a bit, however, in an attempt to appeal to more price-conscious consumers.

The S320 features a 160 x 160 grayscale display and lacks the hardware to produce stereo sound. It does, however, debut at several hundred dollars less than the S300's initial price.

The S320's 33MHz Dragonball processor is the fastest currently available for Palm OS devices. Its 8MB of RAM is bested only by the 16MB of RAM in the Handspring Visor Pro. Palm OS 4.05 resides in 4MB of flash memory. The use of flash memory means Sony can provide users with OS upgrades in the future. Sony estimates about 15 days of battery life from the S320's Li-Ion battery.

Like other CLIEs, the PEG-S320 features Sony's Jog Dial for navigating the device with one hand. There are more applications now

compatible with the Jog Dial, but we still wish we could use the dial to exit an application and select a new one. A Memory Stick expansion slot is available, but unlike other models, the S320 doesn't bundle a Memory Stick.

The PEG-S320 includes software to view images and video clips. I don't mind the image software so much, but I've never been a fan of palm-sized video and won't be until someone introduces a killer app that works within a palm-sized computer's limited storage resources. Palm-sized video is even sillier on a device with a low-resolution grayscale display and no sound.

Although gMovie is more of a curiosity than a useful application, Sony bundles other apps with the PEG-S320, including Race Fever, Bejeweled, AcidSolitaire, Rand McNally StreetFinder, AvantGo, Pocket Vineyard, and Vindigo.

The S320 has all the basics, plus a nice entertainment bundle, but it will appeal primarily to those who already own Memory Stick devices. ▲

by Chad Denton

CLIE PEG-S320
$169
Sony Electronics
(888) 476-6972
(408) 432-1600
www.sony.com/clie

CPU Ranking: 0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect

Compaq S720

With a brushed pewter look and a slimmed-down back end, Compaq's S720 has one of the coolest case designs around for a CRT monitor. And it also provides excellent imaging for a bargain-basement price. The S720, which was strenuously tested for compatibility, should make a good desktop solution for businesses (with its low price, you can buy 'em by the dozen) and home users looking for a new or extra 17-inch (15.8-inch viewable) display.

The Plug-and-Play installation went without a hitch. For testing, I used a 1,024 x 768 resolution with a 75Hz refresh rate (the maximum is 1,280 x 1,024 at 70Hz). Its position was easily adjustable, and the OSD was intuitive, responsive, and quick.

The S720 handled our diagnostic testing well, but on the video bandwidth brightness screen, the thinnest black lines looked a bit gray against a white background, and there was some minor movement during the screen regulation test.

After cranking the brightness up from the 40% factory setting to 70%, all of the grayscale and color test screens looked beautiful. Even when I looked at high-resolution images in Photoshop, the picture looked vividly realistic and richly colored, with a near-perfect balance between light and dark. The monitor also handled all fonts well (white fonts on black looked best at sizes above 7 points).

The S720 is great for the businessperson on the go; it makes Microsoft Office applications look sharp and crystal clear. But home users not looking for extremely high performance will also enjoy its imaging capabilities.

The S720 comes with "true Internet color" software to get the best color from images floating around on the Web. If you're tired of your old CRT, and too poor to invest in an LCD, look for the S720. You'll be glad you did. ▲

S720
$229
Compaq
(800) 888-0220
(281) 370-0670
www.compaq.com

by Cal Clinchard

EIZO FlexScan T565

Let's face it; there are a ton of 17-inch CRT monitors on the market, and which one you purchase depends largely on what's locally available. If you buy the FlexScan T565 from EIZO largely because it is readily available, you will find that it's a decent 17-inch CRT monitor for a competitive price. But if you have time, energy, and money to burn, you can do some digging and find a better high-performance monitor.

Our lab technicians hooked up the T565 on our 450MHz Pentium III VIA system, which uses an NVIDIA GeForce2 GTS video card. I tried out all the standard resolutions (the display remained pretty much identical) but stuck with 1,024 x 768 with a 75Hz refresh rate for testing.

The OSD on the washboard-like front panel is incredibly easy to use. And you might like the fact that, in addition to the OSD, there's a button to change the display's brightness to specific modes for viewing Text, Browser, Picture, Graphic, and Movie. But if you're like me, you'll find this control kind

of goofy. The only way text looks great, for example, is if the monitor is in Text mode, which cuts the brightness a bit and adds some contrast. And I'm not exactly sure what the Picture vs. Graphic mode differentiation is all about, but they both work pretty well for viewing graphics.

The T565 performed well overall, but soared to excellence whenever it came to color and grayscale tests. It balances light and dark perfectly and handles color differentiation brilliantly. My only complaint came when looking at images using Adobe Photoshop; the color seemed a tad washed out in Picture mode and a tiny bit dingy in Graphic mode.

While the T565 probably isn't an ideal first choice for graphics professionals, the rest of us would be satisfied to plop down $439 for the quality the T565 provides. And for an extra $45, you can purchase the made-for-T565 iSound stereo speaker add-on, complete with headphone and mic jacks. ▲

FlexScan T565
$439
EIZO Nanao
(800) 800-5202
(562) 431-5011
www.eizo.com

by Cal Clinchard

CPU Ranking: 0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect

Your wait

HP Scanjet 4470c

Scanjet 4470c
$199
Hewlett-Packard
(800) 752-0900
(208) 323-2551
www.hp.com

Hewlett-Packard has a history of quality, user-friendly scanners, and its 4400 series isn't any different. The HP Scanjet 4470c, which replaces the Scanjet 5300c, is a good flatbed scanner for the home or small office. This sleek scanner is sturdy in spite of its 6.3-pound weight. It comes with eight one-touch buttons on the front of the scanner, and there's also a transparency adapter for slides and negatives.

The scanner has a USB interface with an optional parallel port connection. Its optical resolution is 1,200dpi, and its color depth is 48-bit. There weren't any problems with installation following the easy-to-follow setup guide sheet. Its software bundle includes HP Precision Scan Pro 3.1, Iris OCR, ArcSoft Photo Impression, ArcSoft Photo Fantasy, Trellix Web Express, eFax.com, HP Print Creator, and ACDsee photo management software.

Scan times varied at 600dpi, ranging from 1:25 (minutes:seconds) to 3:34. At 1,200dpi, the scan times were even longer. The shortest time was 1:52 (which was the grayscale test), and the times for color and black-and-white photos fluctuated between 4:12 and 12:30. On the whole, the results were comparable to the originals. Colors were bright, and there was noticeable detail in textures and contrasts. Flesh and hair tones appeared natural. Scanned text had good ink coverage and a clean background. The black-and-white scan was also smooth with sharp details and shading. The transparency adapter was easy to use and produced great results. The grayscale test picked up 26 shades of gray, just shy of our 27-shade benchmark average.

I was impressed with this scanner. Besides being user-friendly, it has a good selection in adjusting the scans, such as brightness/contrast, gamma, and output resolution. You can follow the guided steps or use the advanced adjustments option in the pull-down menu bar. And at $199, the price is pretty user-friendly, too. ▲

by Catherine Geistkemper

Epson Perfection 1650 Photo

Perfection 1650 Photo
$249
Epson
(800) 463-7766
(562) 981-3840
www.epson.com

The Epson Perfection 1650 Photo is an impressive flatbed scanner. Its sleek design includes four one-touch buttons (start, scan to Web, e-mail, and photo print) and a built-in 35mm film slide adapter, yet it only costs $249.

It has a USB cable interface connection and comes with 48-bit color depth and 1,600 x 3,200 dpi capabilities. Its software bundle includes ArcSoft PhotoImpression, Epson Smart Panel with NewSoft OCR, Epson TWAIN Scanning Software, and Adobe Photoshop Elements.

The scan times weren't too bad. At 600dpi, a black-and-white photo scanned in 1:03 (minutes:seconds). Color scan times varied between 50 seconds and 1:54 depending on the detail of the photo. At 1,600dpi, the same black-and-white photo took 3:45, and the color photos' scan times ranged from 5:25 to 14:28. The results overall were comparable to the originals. Colors were bright, and the transition from dark to light was smooth. Details were well-defined, and flesh tones and hair color looked natural. A text scan looked clean and had good ink coverage. The black-and-white photo had good highlights, midtones, and shadow details. The grayscale test picked up 27 shades of gray, which is our benchmark average.

The film slide adapter is built into the lid, and the adapter also produced nice, clean scans with bright colors and good details that were comparable to the originals. There's an automatic box for a one-touch scan with default settings, or you can uncheck the box and adjust the exposure, midtones, shadows, and tone curves through the manual mode. An optional transparency unit is also available.

The one-touch buttons open up to the Smart Panel, and you can choose your preference, such as Scan To OCR, Scan To Application, and Scan For Creativity

Overall, I don't have anything bad to say about this scanner. It's easy to use, produces great scans, and includes a film slide adapter. It's well worth the $249 price tag. ▲

by Catherine Geistkemper

CPU Ranking: ⬜ 0 = Absolutely Worthless 🔲🔲🔲 2.5 = Absolutely Average 🔲🔲🔲🔲🔲 5 = Absolutely Perfect

HP PhotoSmart 1315

When you head to the auto dealership to buy a new car you usually have an idea of what you want. Leather seats and gold wheels are nice, but they aren't necessary. It's your priorities that determine the car you get. The same goes for inkjets. If you're a sucker for flashiness, HP's PhotoSmart 1315 will appeal to you. This is one hopped-up photo printer. For $399, it had better be.

The speedy 1315 (17ppm black text; 13ppm color) is tricked out with features. Some are useful; others feel like unnecessary frills. For instance, you can insert CompactFlash, SmartMedia, or Memory Stick cards into slots on the printer for quick jobs. Better still, a vibrant 2.5-inch LCD display lets you preview and edit photos, so you don't need a computer to produce accurate prints. There's also an infrared port and sensor that automatically detects paper type.

My photo printing tests started off with a glitch. I inserted a CF card, marked the photos I wanted,

and printed them at 8- x 10-inches. The photos were terribly grainy. I replaced the color cartridge and saw much better results. Colors were rich and details good, but the photos had an overly dark tone. Though the printer costs more than twice as much as the $149 Epson Stylus Photo 820, it can't compete with the 820's smooth, six-color gradations and immaculate detail.

The 1315 prints text at a nice clip (7.3ppm) and creates sharp, rich characters. Very little fuzz appeared on either large or tiny letters, making the 1315 one of the few photo inkjets that can moonlight as a document printer. Word and PowerPoint files printed more slowly (1.8ppm average) but had good text paired with excellently colored clip art.

This easy-to-use printer is robust enough to handle a lot of heavy photo printing. There are a few superfluous features you'll pay for, but this really is a virtual Swiss Army knife of a photo printer. ▲

by **Nathan Chandler**

PhotoSmart 1315
$399
Hewlett-Packard
(800) 613-2222
(650) 857-1501
www.hp.com

Samsung SpinPoint SV6004H 60GB

Nothing should shock me by now. Pentium 4 systems are selling for less than $1,300. 256MB of DDR-SDRAM goes for less than $50 now. Even flash memory cards are in serious danger of becoming Secret Santa gifts.

And yet, Samsung's SpinPoint SV6004H—the first 60GB hard drive I've seen selling for $127—startled me out of an otherwise torpid afternoon. It's not that 60GB or $127 are milestones in any way, but come *on*. This 5,400rpm EIDE hard drive costs just over two bucks a gig.

So what's the bad news? Not much, actually. The SV6004H's 512KB cache buffer is pretty small compared to current desktop drives' typical 2MB to 8MB, but that's about it.

The good news is the SV6004H's nonoperating, 2ms shock tolerance of 300G and MTBF of 500,000 hours. It also has Samsung's NoiseGuard and SilentSeek technologies for a 3.2dB seek rating, and the company's ImpacGuard system to avoid head slap. All indicate a quiet, reliable drive.

We installed our test unit in a 600MHz Pentium III system with 128MB of SDRAM,

Windows Me, and a HighPoint DMA/100 EIDE controller. It was generally faster than the 30GB SpinPoint SV3002H we reviewed earlier, giving us acceptable performance.

Under HD Tach 2.61, this SpinPoint read 24.9MBps on average and wrote an average of 16MBps. Its maximum data transfer rates look okay, too, at 32.3MBps for reading and 25.6MBps for writing. Its 14.3ms random access time is also fair. OK, that's enough detachment: All are great figures for a $127, 60GB drive.

Samsung admits that its earlier hard drives haven't been terribly reliable. Even its product representative said one of the older drives expired noisily after a total lifespan of five hours, albeit five hours spent playing Unreal Tournament. However, Samsung says its new manufacturing processes are state-of-the-art, and its new hard drives are built to last. We can't test that claim, but the latest SpinPoints look good so far. ▲

by **Marty Sems**
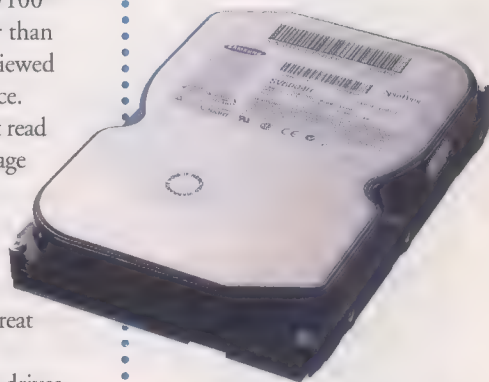
SpinPoint SV6004H 60GB
$127
Samsung
(800) 726-7864
(201) 229-4000
www.samsunghdd.com

CPU Ranking: \ 0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect
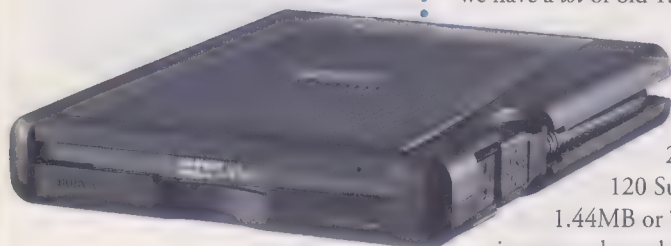
QPS Que! SuperDisk 240MB FD32

I t's all well and good to hear about the latest gizmos, but sometimes we want to make better use of something we already have. And we have a *lot* of old 1.44MB floppy diskettes.

The Que! SuperDisk 240MB FD32 from QPS is an external USB 1.1 drive that uses 240MB or 120MB LS-120 SuperDisks along with 1.44MB or 720MB diskettes. It gets its power through the USB cable but shuts off after four seconds of inactivity to save your notebook's battery.

The interesting thing is the Que! can reformat 1.44MB diskettes to store 32MB—more than 22 times the data. You'll have to use QPS' clunky SuperWriter32 utility to write files to the new 32MB diskette, but Windows Explorer will read the disk just fine. The downside is you'll only be able to read or write the 32MB-formatted disks in this type of drive. In other words, if your friend doesn't have an FD32-type drive,

you can only share files on a 32MB diskette by attaching your Que! drive to her computer.

Of course, we have some reservations. We don't recommend storing anything valuable solely on 32MB diskettes. Floppies aren't very reliable even when formatted to their intended capacities.

Also, SuperDisks lost the removable storage war to Iomega's Zip format, which has in turn lost ground to CD-R and CD-RW. CD-RWs are cheaper, easier to find, and store three times as much as $9.95 240MB SuperDisks. You can also share CD-RWs among most computers with CD-RW drives. If you already have numerous SuperDisks, though, the Que! drive is a sensible upgrade for $159 ($129 after rebate).

Our review drive read and wrote a 240MB SuperDisk at speeds up to 0.5MBps. Our test PC had a 600MHz Pentium III, 128MB of RAM, and Windows Me. The Que! runs under Windows 98/Me/2000 and Mac OS 8.6 or later (with a G3 microprocessor). ▲

Que! SuperDisk 240MB FD32

$159
QPS
(800) 559-4777
(714) 692-5573
www.qps-inc.com

by **Marty Sems**

Keyspan USB 4-port Mini-Hub
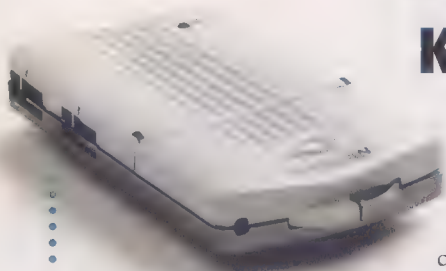
T ell someone at a party that you're stoked about a new USB hub, and she'll probably start looking over your shoulder to see who else she can talk to. Of course, you're far more hip than the other geeks in the room quoting from "Monty Python and The Holy Grail," so your chance isn't completely gone. Reclaim her attention by whipping it out.

You'll show her that Keyspan's USB 4-port Mini-Hub ($49) is smaller than a pack of smokes or even a deck of cards (0.5 inches high x 2 inches wide x 3.5 inches deep). You'll tell her that it supports USB 1.1 with a maximum throughput of about 1.5MBps. You'll explain to her that it comes with a power adapter, but it really doesn't need one because it can get its power from the host PC and even pass it along to bus-powered devices.

Is she still standing there? Good.

Now open the Mini-Hub's secret compartment and reveal its retractable USB connector cable. It's just a few inches long, which isn't

very impressive, but it's still long enough to connect to your notebook PC. Besides, it tucks neatly away when not in use.

The Mini-Hub worked fine with my Q Drive 16MB flash memory device ($69.95; www.agatetech.com) on an IBM test PC with a 450MHz Pentium II, 128MB of RAM, and Windows 98. Unfortunately, it crashed Win98's USB controller hub driver whenever I plugged in a similar EasyDisk 16MB ($39; www.easydiskusa.com). This happened consistently, even after rebooting. I didn't see any obvious electrical or USB version points of conflict in either device's documentation. The EasyDisk, for its part, worked fine when connected to the PC directly.

More common devices performed better with this cool mini-hub in my tests. But hey, if she still walks away from you at the party, at least it might not be completely your fault. ▲

USB 4-port Mini-Hub

$49
Keyspan
(510) 222-0131
www.keyspan.com

by **Marty Sems**

CPU Ranking: ⬜ 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Sony VAIO PCV-RX550

How do you get a 1.5GHz Pentium 4 system for $1,099 ($999 after a $100 rebate)? Opt for one with SDRAM instead of Rambus memory, such as the VAIO PCV-RX550.

Like other Sony VAIO RX Series Digital Studio PCs I've received, this test unit was a pre-production model. The specifications of the final PCV-RX550 will differ, so I've noted the differences in this review. Note that these VAIOs don't come with the monitor or camera shown in the photo. The 17-inch Sony Trinitron HMD-A200 display that came with mine is a $299 option.

Specifications. My test system had a 1.8GHz P4 instead of the 1.5GHz the final version will have. In both cases, there's an Intel 82845 chipset handling the P4's PR, and 256MB of PC133 SDRAM. That's far more memory than most users will need for a few years. However, with memory prices so cheap (I've recently seen 256MB of PC133 SDRAM selling for about $29), why not run up the score a bit? All three VAIOs have the same 512MB maximum RAM limit. That's less than most PCs' limits, but still more than you'll likely need.

The VAIO PCV-RX550, along with the other models shipped to me, use Maxtor 5,400rpm 536DX hard drives. This one used in the PCV-RX550 is an 80GB model, although the final PCV-RX550 will have a 60GB drive.

This PC has two acronyms I like to see: CD-RW and DVD. With both a Sony 16X/10X/40X CRX175E CD-RW drive and a Pioneer 16X DVD-117R DVD-ROM, it's getting harder to believe this VAIO costs just $1,099.

Design. This series of Sony VAIOs share the same style of minitower case. It's easy to open without a screwdriver, although one look at the inside will make you regret doing so. To upgrade something on the motherboard, you'll have to pivot the power supply and diskette drive bay outward. It's pretty cramped in there.

There's a USB port and an iLink (IEEE 1394) port hiding under a hatch near the bottom of this VAIO's front panel. Another iLink port and two more USB ports reside on the back, supplemented by five more USB jacks on the optional monitor.

All three VAIO models I looked at have 56Kbps modems and 10/100Mbps Ethernet jacks. They also share the same Sony PCVA-SP2 speakers, keyboard, and contoured mouse.

Performance. After a wait for Windows XP patches for SYSmark2001, Video2000, and 3DMark2001, we benchmarked this Sony PC. It gave us an OK 152 SYSmark, 2,317 Video2000 score, and a 925 3DMark2001 rating that makes the video card look worse than it felt during use. Remember that the production model will have a much slower processor than the VAIO we tested.

Next, I played my Peter Gabriel audio CD in the VAIO to kick off the fun part of testing PCs. One song in particular combines brooding, plucked bass chords with Kate Bush's wispy cooing and Peter's raspy vocals. I was pleasantly surprised at how well the Sony speakers reproduced the song. I'm an avowed subwoofer convert, but these two speakers sounded nearly as deep (not to say as loud) without one.

The DVD was another story. I didn't get decoder software with this VAIO, but Sony's representative said this was an oversight. It turns out that Microsoft's Media Player for Windows XP doesn't really decode DVDs after all. I tried to install CyberLink's PowerDVD 3.0, but it kept erroring out. The drive would read files from both CDs and DVDs and even play some features using the PC Friendly software included with "U-571" and "The Matrix," but not the movies themselves without decoding software.

Finally, the 32MB NVIDIA RIVA TNT2 3-D card made Quake III Arena smooth at 800 x 600 resolution and somewhat playable at 1,024 x 768. Gamers should upgrade to at least a GeForce2 MX. Still, the TNT2 is fine for casual 3-D gaming, movies, and other graphics.

Final Word. The VAIO PCV-RX550's huge software bundle includes loads of audiovisual editing programs, in addition to Internet Explorer 6, Media Player for Windows XP, PC-cillin 2000, and Tomb Raider Chronicles. Ours came with Adobe Photoshop Elements, although Sony says Adobe Premiere 6 LE will actually ship instead. The final VAIOs should also have Corel WordPerfect 9.

Even with a lesser P4 and a smaller hard drive than our review unit, the production VAIO PCV-RX550 should still be a great deal at $1,099. ▲

---

by Marty Sems
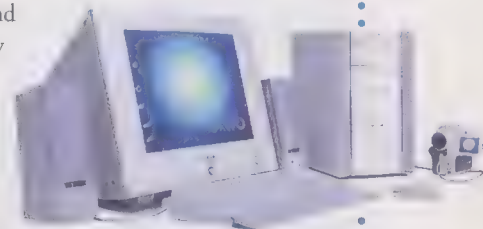
VAIO PCV-RX550

$1,099 ($1,398 w/ monitor)
Sony
(888) 595-8246
(941) 768-7669
www.sony.com

Features

Processor: 1.8GHz Pentium 4 (will ship w/ 1.5GHz)

RAM: 256MB PC133 SDRAM

Hard Drive: 80GB (will ship w/ 60GB)

Optical Drive: 16X DVD-ROM; 16X/10X/40X CD-RW

Connectivity: 10/100Mbps Ethernet; 56Kbps modem

Graphics Accelerator: NVIDIA RIVA TNT2 Model 64

Monitor: 17-inch Sony Trinitron HMD-A200 (optional)

Chassis: Minitower

System Use: Personal use

Final Word: DVD and CD-RW; lots of connectivity

CPU Ranking: 0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect

Cooler Master ATC-201
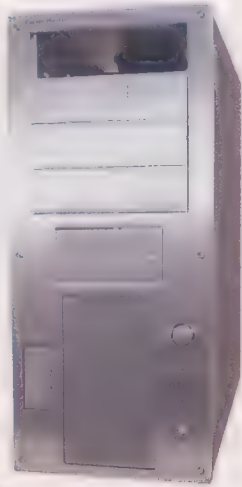
ATC-201
$270
Cooler Master
(510) 770-8566
www.coolermaster.com/home.html

ooks, cooling, acoustics, and weight take center stage with DIY PC enthusiasts, and the three Bs (Big, Boring, and Beige) are out. ATX PC cases are now dressed in aluminum alloy, which is all the rage. The Cooler Master ATC-20 barely tips the scales at 12 pounds. The drawer-style, pull-out motherboard tray is accommodating for hardware installation/upgrades. Fastened with thumbscrews that can be hand tightened/loosened, everything is accessible and well put together. Corners are rounded, and the innards of the case are "finger-friendly."

Sporting four 5.25-inch and two 3.5-inch exposed bays, as well as four hidden 3.5-inch bays, the ATC-210 has the sort of capacity that rivals server cases in terms of real estate. With external dimensions of 17.8 inches high x 7.7 inches wide x 19.5 inches deep, the ATC-201 fits snugly under almost any desk. Installation of hardware is simple and nowhere near as time-consuming as (admittedly) less pricey conventional cases.

With four fans onboard, it's obvious that ACTS (Active Thermal Convection System) is more than just marketing fluff. Cool air is drawn through dual-filtered 80mm fans at the front of the case and blown directly onto an installed motherboard. An 80mm exhaust fan atop the case expels (via blow hole) hot air, which normally rises and accumulates. There is another 80mm exhaust on the back panel. Aesthetics aside, the entire case is constructed of aluminum because it conducts and disperses heat in similar fashion to a heat sink. The entire mechanism is quiet and well worth the added incentive it gives overclockers.

The front panel harbors a door concealing two USB ports, which you can hook up via a compatible motherboard interface. Very handy indeed. At $270, the ATC-201 case doesn't come cheap but is still my new favorite, and I've had more of them than hot dinners. If you're a LAN partygoer, don't leave home without one. ▲

by Alex "Sharky" Ross

Lian Li PC-60 USB
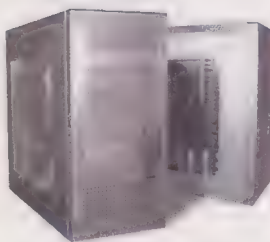
PC-60 USB
$199
Lian Li
886-2-2451-3000
www.lian-li.com.tw

ian Li is the manufacturer primarily responsible for bringing aluminum cases to the masses via their attractive pricing and widespread distribution. While not as poncy as Cooler Master's ATC-201, the PC-60 USB is far from being the poor man's alternative. It has great looks and the capacity to compete with server cases, and it only weighs 16.2 pounds.

Installing a Pentium 4/Athlon system is easy, thanks to the pull-out motherboard tray and thumbscrews, making every nook and cranny accessible. Housing four 5.25-inch and three 3.5-inch external drive bays and five 3.5-inch internal drive bays, the PC-60 is great if you plan to run a RAID setup with multiple drives. (You do have to rack the bays vertically, though.)

The PC-60 USB does come in a bit wide under your desk at 19.2 inches high x 8.2 inches wide x 17.7 inches deep, but because the corners are rounded, you will just get a bruising rather than draw blood if you bash your knees. And while we're under the desk, we should note that the PC-60 USB comes with four front USB

ports, two more than the ATC-201, that hook up to your motherboard's USB pin-out header.

The PC-60 achieves cooling with three 80mm fans, including two filtered units up front. The third is a rear exhaust fan. There is no fourth fan, or "blow hole," on top. The fans are quite loud, but there is a three-speed control switch for these noisy blighters. If you are overclocking, use third gear for max cooling (and noise); otherwise, stay in first gear and save your ears.

For an extra $20, you can accessorize your PC-60 USB with a Plexiglas side-window. If you're not into that sort of thing, perhaps the better way to accessorize is the the optional front panel I/O gamer multiport ($45), which snugly replaces one of the external 5.25-inch front drive bays.

At $199 (not including PSU), Lian Li's offering is about $70 less and a close second to Cooler Master's ATC-201, but second nonetheless. ▲

by Alex "Sharky" Ross

CPU Ranking: 0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect

room to burn
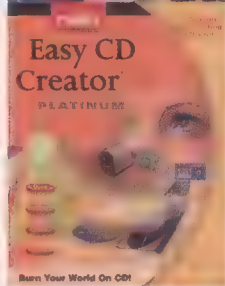
Get organized, and take your files with you wherever you go. Burn all your data, video, photography, MP3s, vinyl, cassettes and whatever else you've got to CD with Easy CD Creator® 5 Platinum, from Roxio. The best selling CD burning software in the world. You can even create your own personalized jewel cases for each disc. Hit roxio.com to find out how. Mac users check out Toast® 5.

Now Windows® XP compatible.

VINYL DIGITAL VIDEO DATA BACKUP ORIGINAL MUSIC DIGITAL PHOTO MP3

roxio

by Anand Lal Shimpi

Time For Winter Graphics

Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' 48 Hours and Fortune. His site— www.anandtech.com— receives more than 55 million page views and is read by more than 2 million readers per month.

If you've been waiting for the right time to upgrade your aging system, that time is now. Motherboards based on NVIDIA's nForce and VIA's KT266A are finally appearing in the channels, and now you can pair them with none other than the fastest desktop x86 processor on the market, the AMD Athlon 1800+. The combination of the two, an ample amount of very cheap memory, and a speedy 7200RPM hard drive can be had for pocket change compared to what we were spending last year for hardware. But all of that added performance is useless if you can't play some of the great new games coming out before the end of the year, right? That means you'll also be looking to upgrade your video card and as luck would have it, both ATI and NVIDIA have released their fall product lines, making this even more of an upgrade season.

First from NVIDIA, we have seen the launch of their Titanium (Ti) series of graphics cards. The GeForce2 Ti 500 is based off of the older-generation GeForce2 hardware with a slightly higher core clock yet no more memory bandwidth than a GeForce2 Pro. More astute readers will pick up on the fact that memory bandwidth reigns king at higher resolutions, and thus the GeForce2 Ti 500 does not outperform the GeForce2 Pro by any noticeable margin. By far the most interesting member of NVIDIA's fall lineup is the GeForce3 Ti 200, which is priced at $199 (MSRP; you can find them on the 'Net for $20 to $30 cheaper). While it's approximately 10% slower than the six-month-old GeForce3 mainly because of a reduction in memory clock speed (200MHz DDR vs. 230MHz DDR for the GeForce3), NVIDIA also reduced the core clock speed down to 175MHz (from 230MHz), making the chips cheaper to make and cooler-running as well. The beauty of this card is that it offers great performance at a very reasonable price. For those with a less constrained budget, NVIDIA also offers a GeForce3 Ti 500 that ends up being around 20% faster than the Ti 200 in most cases. The Ti 500 retails for $349 to $399.
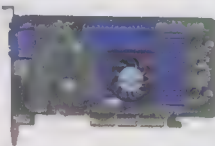
One of the most highly anticipated fall line-ups was from ATI with their Radeon 7500 and Radeon 8500 cards. Both of these cards use new chips from ATI manufactured on a smaller 0.15-micron process. A small manufacturing process results in a cooler-running and smaller chip core that is also usually cheaper to manufacture in the long run. The Radeon 7500 is actually much like the original Radeon that was launched well over a year ago, simply clocked at a higher 290MHz core with 230MHz DDR SDRAM. However, even these higher clock speeds aren't able to give the 7500 the edge over the similarly priced GeForce3 Ti 200. The Ti 200 consistently outperforms the Radeon 7500 in real world gaming tests.

> **Unfortunately when push came to shove, the Radeon 8500 was barely able to compete with NVIDIA's low-to-mid range GeForce3 Ti 200.**

ATI's knight in shining armor was supposed to be the Radeon 8500. Based on what ATI internally referred to as the R200 chip (the Radeon was based on the Rage 6C), the 8500 was given more memory bandwidth, a higher fill rate, and the same DirectX 8 pixel and vertex shader capabilities of NVIDIA's GeForce3. To top things off the Radeon 8500 also has a theoretically superior anti-aliasing engine and ATI's multi-monitor HydaVision support. Unfortunately when push came to shove, the Radeon 8500 was barely able to compete with NVIDIA's low-to-mid range GeForce3 Ti 200. Coupled with a history of poor driver releases and criticism from many that they are unethically sacrificing image quality for added performance in game benchmarks, the Radeon 8500 launch has become far from ideal for ATI. The chip had potential, but the clear choice today is with NVIDIA and things will get even more exciting early in 2002. . . . ∎

Feedback welcome at Anand@cpumag.com.

(NOTE: For performance results and reviews of all of ATI's and NVIDIA's fall lineup, visit AnandTech.com's Video Section.)

by Alex "Sharky" Ross

All I Wanted For Christmas...

There's no doubt that the current economic climate has wreaked havoc here in Silicon Valley. All year long tech companies have been pounded by swells of economic gloom and doom. Truth be told, year-end has traditionally been big on the PC, with a wealth of products released in the fall, shown at Comdex, and snapped up by shoppers for the holidays. Not so for 2001.

NVIDIA put aside its NV25 chip until next year. Intel did the same with its "Northwood" Pentium 4. AMD did go ahead with Athlon XP, but other than Windows XP, which is great and all but still not quicker than a ray of light unless you pile on the RAM and a very fast processor Bill, there's not been a whole lot to shout about this year.

But if you've got some post-Christmas cash to splash thanks to Auntie Ethel and her wooly socks, there are still a few toys out there to get your teeth into on the PC side, especially if you're an addict like me. Here's a short list:

Great deals on **giant hard drives** (60GB and up). Any catch? Yes, the reason for this slash in ATA-100 drives is because ATA-133 drives are on their way. Still, if you're just looking for a storage solution and not needing to break the performance barrier, now is a good time to file away your gigabytes of mp3s and 1997 Best of Welsh Sheep Show high-res digital snaps.

The **Microsoft Wireless IntelliMouse Explorer** is great and not just because it's wireless, but because it seems to suit my hand better than any other mouse I have tried. The IntelliEye optical sensor captures 6,000 fps, which is ample for any first person shooter. And since it's not attached to anything, if you get fragged, you can throw the mouse at the wall, assuming you don't mind it smashing.

The CPU price wars and race from 1 to 2GHz have led to huge price drops for **AMD and Intel CPUs**, which have had a rather nice trickle-down effect on us DIY enthusiasts.

Coupled with extremely low memory prices (except RDRAM) and hard drives, building a gaming system has never been so cheap and/or fast.

My favorite new toy is a **Sony SDM-M81 Flat Panel LCD**, and I do mean flat. It takes up one-fourth the desk space of my old 19-inch monitor and doesn't give me hernias. The only limiting factors are that v-sync is always enabled and you won't be able to play in 1,600 x 1,200 unless you jump beyond the 18-inch screen size into $2,000 to $3,000 territory. 1,280 x 1,024 is as far as they go, but the new 18-inchers from Sony, NEC, and ViewSonic all seem rather attractive at ~$1,000. If your budget is at a premium as much as your space, you can pick up 15-inch flat panels for $300 to $400 these days, almost a 50% price drop from last year.

The **Creative SoundBlaster Audigy** (I opted for the music/game-friendly Platinum EX version) promises improved 3-D audio, sound quality, and performance. Music lovers should enjoy the improved audio and reverb as well. The bundled software is fun to spin with, especially if you are a follower of the trance-loving-Oakenfold genre.

Another new and "exciting" feature is **USB 2.0**, or at least when it works it will be. Currently you can pick up CD burners with USB 2.0 adapters that write at 24x (not as nippy as FireWire but convenient nonetheless) for as little as $200. Trouble is, until the Windows XP USB 2.0 update comes out, it's USB 1.0 only.

Which brings me to my New Year's wish. If **World Peace** isn't an available selection, here's hoping that by early Q1 2002 all the teething problems of Windows XP get ironed out, even if it takes "Update no. 5876b.11c" to get there and drives us all nuts in the process. As an added bonus, once we do get patched up, all this brand-new hardware we've bought will actually work like it's supposed to. Truth be told, XP is the most stable OS from Microsoft yet and it only took 11 years, but as a proud subject of her Majesty and a British passport holder, I for one won't be signing up for Mr. Willy Gates' .NET Passport stuff. I'm not sure I want his subjects in Redmond knowing my tastes in music, games, Web sites, and toothpaste, even if he does pay taxes, unlike the Queen. ■

E-mail me at sharky@cpumag.com and I'll tell you why SharkFin soup causes brain damage.

Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently swims in Silicon Valley.

By Kyle Bennett

Welcome To Our World

You bought an issue of *Computer Power User.* That means you are already a computer power user or you are thinking about joining our ranks. You have probably heard us referred to mostly as "geeks," but we are the people others point at and say, "Ask him, he's the 'computer guru.'" One thing is for certain, no matter what you call us, we all share a passion for building, tweaking, and troubleshooting computers. For many of us, this has grown beyond a job or a hobby and has become an obsession.

If you are one that is about to make the leap to our ranks, there are few things that you need to know first:

1. If you value the warranty that comes with your newly purchased computer hardware, then being a computer power user is not for you.
2. If you don't have hours of spare time to feed your addiction, then being a computer power user is not for you.
3. If you're already seeing a psychiatrist because you worry too much, then being a computer power user is not for you.

On the other hand, being a computer power user offers handy benefits that you will not find with other hobbies, such as:

1. You get to brag to your new buddies about the awesome "box" you just built and how many cubic feet of air per minute you're moving through your new "rig" via that 120mm BlowHole. Not to mention you'll be exposed to an entire new vernacular.
2. Learn the secrets of how thermodynamics and metallurgy directly affect you and why you should always keep a fire extinguisher nearby.
3. Best of all, you get to wave goodbye to the likes of all those corporate companies that you have relied on in the past. Now you have to call yourself for tech support, so don't gripe if you get put on hold for hours at a time.

Seriously, if you are expecting to make the leap to the "Dark Side," don't expect much help or warranty service for your hardware. I'm going to show you how to do some things that companies like NVIDIA, ATI, Intel, or AMD don't want you to know, or at the very least, they don't suggest in any way, shape, or form.

I'm not only going to give you guided tours of how to overclock your CPU, but I'll dig into the video card and memory, as well. Having the right motherboard nowadays with the proper tweaks available onboard can be as valuable as having the next CPU upgrade by a couple of hundred megahertz. Also, I'm going to be on the look out for which CPUs overclock better than others. Oh yes, young Jedi, not all silicon is the same, even if at first glance you might think otherwise.

Walking hand in hand with overclocking is cooling. The most common cooling I see done is air-cooling, but even now fully water-cooled commercial systems are coming on the market. Many of these offer superior cooling and therefore allow for better overclocking.

This art alone has grown into a huge market segment that is fully supported by many retailers and manufacturers. With a combination of the right equipment you will be very surprised at the performance increases that are possible.

My focus here is to get you more in tune with your hardware and what it's capable of. I want to show you how to take the normal everyday equipment you can buy at retail outlets or online and tweak it to perform beyond its stated specified capabilities.

I'll be tweaking CPUs, motherboards, video cards, heatsinks, cases, and even looking at simple fans and what they can do for you. Also, a very good point to keep in mind is even if you're not going to be tweaking your own hardware at home, I often find some of the better equipment on the market during my testing. If we cannot kill our hardware pushing it to the edge, then we can be that much more certain that the hardware will operate properly under spec conditions. ∎

> I'm going to show you how to do some things that companies like NVIDIA, ATI, Intel, or AMD don't want you to know . . .

Kyle Bennett is editor-in-chief of HardOCP.com (http://hardocp.com), one of the largest and most outspoken online PC-enthusiast sites on the Web. HardOCP.com is geared to users with a passion for PCs and those who want to get cutting-edge performance from their systems. Beware, though, Kyle is known for his strong opinions and stating them in a no-nonsense manner while delivering some of the most in-depth reviews and PC hardware news on the 'Net.

You can talk with Kyle at kyle@cpumag.com.

Each month we ask a staff writer to take on our publication editor in a challenge to build the best PC for a certain price. Because our writers don't want to lose their jobs, they always accept this challenge willingly. Tempers will flare. Tools will fly. But only one will prevail.

This month the challenge is to build the
Best Budget Gamer PC for less than $1,000.

Samit

My favourite topic: gaming. Hmmm, who's up this month? Aaah, Marty. Exxxcellllent. Another opportunity for Samit "Insidious" Choudhuri to test his mettle (or as some would say, the lack thereof). Muhahahaha! And better yet, another opportunity for me to talk about myself in third person. Life just doesn't get any better for Insidious (that's me), does it? Time to swing the proverbial hammer <insert knuckle crunching sound effect here>.

This month's assignment was to build a budget gaming system for less than a grand. I weighed my options and thought about things insidiously as I sipped a frilly umbrella drink on the beaches of Tahiti. Then I woke up. I decided more thinking and a beer were in order. The plan materialized. If you are building a gaming system without a monitor, you are probably upgrading your crumbling rig. So that means you probably already have a monitor, speakers, game controllers, and software.

Let's face the facts: Budget means cost cutting. But I didn't want to build a system that would require upgrading within six months, and the nForce was not yet available. This rig's got some kahunas. Check it: Respectable 3D-Mark2001 score, GeForce3 Ti 200, Hercules Game Theater XP, Corsair 256MB DDRAM, seven USB ports, and optical dual-wheel mouse. The Gigabyte mobo has built-in sound, so you could conceivably get rid of the Game Theater XP and put the $95 toward something else. I dropped Max Payne, Alien Versus Predator 2, and quite a few other taxing games on what I call the Insidious Gamer PC (on a budget); it handled all with aplomb. Ya like that, Marty? Aaw yeeaaaaah. Bring it on, baby.

OK, so I've still got $32.26 of my $1,000 budget left to spend or $127.26 if I return the Game Theater XP. Yeah, I could buy myself a few drinks (Chimay comes immediately to mind), but I'd probably put the extra cash toward the purchase of a second 20 or 30GB hard drive, CD-RW, or another 256MB of RAM. The first IDE port has the 7200rpm Maxtor hard drive and DVD-ROM drive. The second port is all ready to go; it's just begging you for another plug-and-play drive upgrade.

I would suggest the Sony CPD-G420S (19-inch, 0.24 dot pitch) in case you need a quality monitor with strong refresh rates. (Although the monitor wasn't part of this challenge.) This beaut was available online for as little as $433 at press time. You could spend a lot less (see the December issue), but I'd recommend you buy a keeper that will placate your eyes for the next few years.

Those in dire need of speakers should check out the THX-certified Logitech Z-560 4.1 speakers. We found these online for less than $150 and boy, do they sound good. You can find the Creative Inspire 5.1 5300 online for as little as $82. Both will complement the DVDs you'll be watching on your DVD-ROM drive.
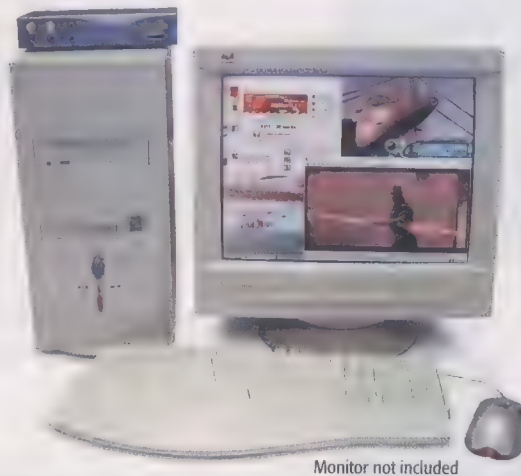
Samit G. Choudhuri
Publication Editor
Computer Power User

Component	Model	Price
Case	SuperCase ATX Mid Tower (300W P/S) [1]	$49
Motherboard	Gigabyte GA-7VTXE ATX (VIA KT266A) [2]	$99
Processor	AMD Athlon XP 1500+ (Retail), AMD Retail CPU Bundled Fan & Heat Sink [2]	$142
Memory	Corsair PC-2100 256MB DDRAM [2]	$48
Hard Drive	Maxtor 5T020H 20GB ATA100 7200RPM (OEM) [2]	$72
Video Card	Gainward GeForce3 PowerPack Ti/450 (Ti 200) with TV-Out (Retail) [3]	$192.50
Sound Card	Hercules Game Theater XP (OEM) with 3.02 Drivers [2]	$95
Network Card	Netgear FA311 Ethernet Card 10/100 (OEM) [2]	$13
CD/DVD-ROM	Pioneer DVD-116 (OEM) 16X DVD/40X CD-ROM [2]	$58
Diskette	Mitsumi FD 1.44MB (OEM) [2]	$9
Speakers	You already have speakers, don't you?	N/A
Mouse	DIT Optical 4D Dual-Wheel PS/2 & USB [1]	$19
Keyboard	Microsoft Natural Keyboard Elite (OEM) [2]	$19
Software	Windows XP Home Edition (OEM) [1]	$99
Miscellaneous	Registered version of WinDVD for WinXP bundled with Gainward video card; using NVIDIA Detonator XP v21.83 drivers; seven USB Ports	
Subtotal		$914.50
Shipping	FedEx Express Saver	$25.98
	FedEx Two Day	$16.40
Tax		$10.68
Total		**$967.74**
3DMark2001 score		6,311

Purchased from
[1] D.I.T. Corporation
[2] NewEgg.com
[3] Googlegear

Monitor not included

Marty

My ultimate gaming PC for less than $1,000 had to have an Athlon. The Pentium III can't touch 1.4GHz (ignoring overclocking), and only a much costlier P4 can match a 1.4GHz Athlon's overall performance. The Athlon XP came out after I ordered parts, so I bought a Thunderbird with an Elitegroup K7S5A, an inexpensive DDR-compatible motherboard. DDR is dirt cheap these days, but I paid a little extra for CAS2 (column address strobe, latency ratio 2) PC2100 memory. Crucial brand CAS2 was difficult to find by deadline, so I bought 512MB of Nanya brand.

A gaming PC is judged by its 3-D card, so I snagged a Gainward 64MB DDR GeForce2 Pro/450. The Logitech iFeel mouse cost just a bit more than a regular optical mouse, and it definitely adds palm-bucking tactile fun to games such as Black & White, Unreal Tournament, Half-Life, Quake and Star Trek Voyager: Elite Force.

With a quad-sound Altec Lansing ACS54 sound system including a ground-pounding subwoofer on this PC, you'll never Quake so good for so little. A Creative Sound Blaster Live! Value card added rear speaker support. Meanwhile, the onboard 10/100Mbps Ethernet and the Enlight case's moderate size make this rig perfect for LAN parties. Add an inexpensive Compaq S720 17-inch monitor (not part of this challenge), and you're set.

Monitor not included

I ordered almost everything online. Yeah, that meant shipping costs, but anyone whose town's mom-and-pop computer store still hawks Voodoo3 cards for $195 knows the Web is a great equalizer. I ruled out eBay because even if *I* could find a working Athlon XP 1800+ for nine bucks, *you* probably wouldn't be able to. I did buy an extra 80mm case fan locally, as I didn't have any livestock that needed branding in the pattern of a heat sink. Speaking of which, I recommend upgrading the 4,800rpm heatsink fan that comes with this Athlon bundle with a faster one for better cooling.

I didn't cheat by "donating" old software I had lying around. This system's one weak link is WinMe, which is slower than Win98 running with System Restore disabled. I've also discovered that, out of the box, WinMe is buggier than a frat-house couch. But I found it much cheaper than even Win98. I spent the savings on a better GeForce. Win2000 or WinXP would have blown my budget and, as of this writing, WinXP still has issues with hardware such as the Live! Value sound card.

All this without overclocking and money left over for a copy of UT. See you in the arena, frag bait!

Component	Model	Price
Case	Enlight EN-7237 midtower case, 300W p/s [1]	$60
Motherboard/ Processor Bundle	Athlon Thunderbird 1.4GHz 266fsb, heatsink/fan, ECS K7S5A motherboard bundle (included ATA/100 and floppy cables, PC-cillin antivirus software) [2]	$193
Memory	512MB Nanya PC2100 CAS2 DDR [3]	$90
Hard Drive	Seagate Barracuda ATA IV 20GB [4]	$81.95
Video Card	Gainward Cardex GeForce2 Pro/450 64MB DDR w/ TV out [5]	$151
Sound Card	Creative Sound Blaster Live! Value [5]	$33.20
Network Card	Integrated 10/100 [2]	N/A
CD-ROM	LiteOn 52X CD-ROM drive [2]	$42
Diskette	1.44MB floppy drive [2]	$15
Speakers	Altec Lansing ACS54 speakers/subwoofer [3]	$44
Mouse	Logitech iFeel USB optical wheel mouse [6]	$32
Keyboard	Mitsumi standard keyboard [2]	$15
Software	Windows Me OEM Full Version [2]	$74
Miscellaneous	ATA/33 ribbon cable [4]	$1.75
	Thermal grease [2]	$2.95
	CPU shim [2]	$6
	80mm case fan [7]	$14.99
Subtotal		$856.84
Shipping		$107.11
Tax		N/A
Total		**$963.95**
3DMark2001 score		3,516

Purchased from
[1] Mwave
[2] Compubuzz
[3] ComputerHQ
[4] Allstar
[5] Compuvest
[6] EMS Computing
[7] Radio Shack

And The Winner Is . . .

Marty and Samit took very different approaches to this challenge. Samit's system is perfect for gamers who have a pretty decent foundation to work with but would like to upgrade to something better. Marty's approach takes users with almost nothing and gets them gaming. I'm tempted to give them both the nod, as both systems serve their intended purpose well. But you know men; they always want to know who's the best, so here goes.

If I'm a gamer looking to get the best performance for my money, I have to go with Samit's PC. I just can't pass up the Athlon XP, GeForce3 Ti200, and WinXP. And look at that 3DMark2001 score! If it were me, though, I'd save the money Samit spent on the DVD-ROM drive, add it to his $32.26 left over, and buy some speakers, even though Samit's guess that you already have some is a good one.

To be sure, Marty's system is nothing to sneeze at. His standard keyboard features the inverted "T" arrow keys that make player movement easy, and the iFeel mouse offers great tactile feedback. Plus, his rig boasts 512MB of memory (compared to Samit's 256MB), but as Marty said, it's the video card that makes or breaks ≡ great gaming PC. And I had a bad experience with a buggy frat-house couch once, so WinMe's resemblance doesn't sit well . . . *Jennie "The Judge" Schlueter, content editor*

Marty Sems
Staff Writer
Computer Power User

Swappin' Parts

There's A Transformation Taking Place

Each month in "Swappin' Parts," a Computer Power User writer upgrades one out-of-date component in our test machine, MERLE (Mediocre Electronic Refurbished Low-end Equipment). When we're finished, we will have transformed MERLE from a silicon trash can into a powerful system we'd be proud to put in our own homes. To date, we've upgraded MERLE's CPU from an AMD 850MHz Duron to an AMD 1.4GHz Athlon.

Most computer upgrades help improve a computer's performance, but this isn't always the case. A new monitor won't make your games run faster, and a new scanner won't improve your ability to surf the Web. That's not to say these upgrades don't have value, though. They improve your PC in other ways. That's why this month we're giving our test PC, MERLE, a new sound card.

MERLE Gets His Groove On

MERLE is tone deaf. He has a tin (OK, silicon) ear in the form of an integrated audio chip. That integrated audio chip isn't bad for everyday, ho-hum computer use. But we wanna rock. So this month we're muting MERLE's integrated audio and plugging in a proper sound card in the form of a Creative Labs Sound Blaster Audigy Platinum.

The Sound Blaster Audigy Platinum won't improve the computer's overall performance, but it will make MERLE sound much better. MERLE has a tendency to pop and crackle when we listen to our favorite Stevie Ray Vaughan

The tin-like audio our test machine MERLE was outputting was more than we could stand. An upgrade to a Creative Labs Sound Blaster Audigy Platinum card was in order.

Ah, that's more like it. MERLE's new sound card and Audigy drive are now worthy of cranking out Stevie Ray's massive chops.

Installing the sound card wasn't too difficult, but MERLE was sensitive to us tickling his insides. As a defense, he bloodied our fingers as we were removing a PCI slot cover. We'll forgive you this time, MERLE. This time.
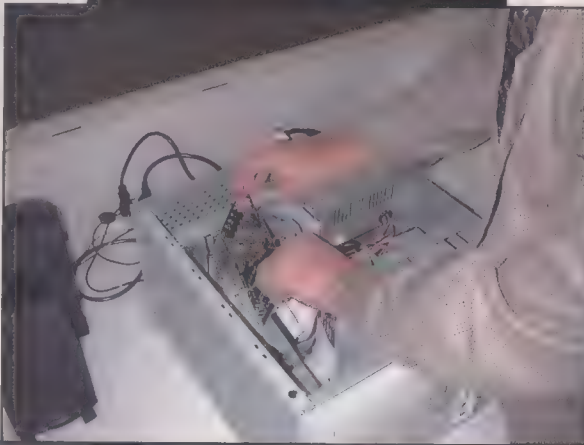
CDs. It's like MERLE's throwing a temper tantrum. Or maybe MERLE just doesn't like the blues. A new sound card will make MERLE appreciate the power of a Fender in the hands of a true blues original.

The Audigy sound card supports Dolby Digital sound, so we can connect a 5.1 speaker system to MERLE; something we can't do with the integrated audio chip. We have a Klipsch 4.1 speaker system ready to plug into MERLE as soon as we upgrade the sound card, which is 400 rms watts of deafness in waiting, friends. We can blast the Computer Power User editors right out of their big fat cushy chairs with this rig, and we intend to.

The Sound Blaster Audigy Platinum kit also includes an Audigy drive, which is clearly a useful, practical device for many users. (OK, the real reason we want the Audigy drive is because it's a cool extra gadget we can shove into MERLE's craw.) The Audigy drive slides into an open drive bay and has a variety of inputs for audio and video equipment, such as Optical In and Optical Out, MIDI In and MIDI Out, and an IEEE 1394 input for high-speed peripherals. Is MERLE worth this $199 upgrade? Yes, because we're not paying for it. If you think the Audigy Platinum is too pricey for your humble system, however, you can buy the sound card without the Audigy drive for $99.

Installing The Hardware

You'll need to do a little prep work before you install a sound card on a motherboard with integrated audio. Before we opened MERLE, we disabled the onboard audio in the system's BIOS. We then removed the AC '97 drivers from the System Settings in Control Panel. This mercifully silenced MERLE, and at this point we were ready to open him up and install the new hardware.

We unplugged the system and grounded ourselves. The Audigy Platinum card requires one PCI slot, but you'll have to sacrifice two because the game port bracket is a separate piece of hardware you'll install in a PCI slot next to the sound card. The game port bracket connects to the sound card via a small ribbon cable. MERLE has five unused PCI slots, so this isn't a problem.

As we started to remove one of the PCI slot covers on MERLE's back, he promptly sliced both index fingers, simultaneously. We've upgraded dozens of machines hundreds of times without injury, so we think MERLE is responsible. With bloody fingers, we swore at him profusely while ripping the PCI slot covers out.

Next, we removed the drive bay cover from an empty 5.25-inch bay for the Audigy drive. We didn't have a screwdriver handy to pop the cover's tabs out, so we stuck a fist into the drive bay from behind and punched it out.

The Sound Blaster Audigy kit includes several cables, some of which need to be attached to the Audigy drive and sound card before installing them. We plugged the CD audio cable into the back of MERLE's CD-ROM drive. Next, we connected the SB1394 and ribbon cables to the Audigy drive as directed and slid the drive into the drive bay. We attached the joystick bracket to the sound card using the bracket's attached ribbon cable.

After mopping the blood off the PCI slot we wanted to use, we pressed the sound card into it. Then we placed the joystick bracket in the PCI slot next to the sound card. We attached the ribbon cable from the Audigy drive to the sound card and plugged in the audio cable from the CD-ROM drive. Everything looked fine, so we

put MERLE's cover back on and gave him a sharp kick in the power supply before plugging him in.

We restarted the system, installed the software drivers for the Sound Blaster Audigy, and restarted the system again.

MERLE found the sound card without problem and was about ready to get his groove on. During our upgrade, we noticed the Creative Labs Launcher interface is a lot slicker than with past versions, such as the one included in the Creative Labs Sound Blaster Live! card series.

Our final task was setting up the Klipsch 4.1 speakers, which was pretty easy. The speakers plug directly into the 160w big-rump subwoofer, with two additional cables running to the inputs on the sound card: one for the front speakers and subwoofer, and one for the rear speakers. The Klipsch 4.1 speakers have about 387 yards of speaker wire, but we managed to keep the wire under control by wrapping it up.

Post-Operative Observations

We listened to several audio tracks after the upgrade to see if MERLE sounded any better. He did, of course. MERLE morphed from a choking, wheezing, two-bit lounge act into a swinging, melodious, Elvis-like lounge singer. With MERLE now having 400w of sound wave fury at his disposal, we could rattle the windows of CPU headquarters with "Viva Las Vegas." No more pops or crackles, and no more topping out at 78 dB. MERLE now roars.

Overall, the sound card upgrade makes MERLE a better PC, especially when using the Klipsch speakers. But as a matter of record, we still needed to run our benchmarks on MERLE to determine if the upgrade would affect

MERLE's performance. We found that it did, slightly.

The increase in performance registered last month after upgrading MERLE's CPU was considerable. MERLE's Overall SYSmark2001 score jumped to 72, with an Office Productivity score of 66 and an Internet Content Creation score of 79. MERLE's Video2000 score after the upgrade was 1,572.

After installing the sound card, we ran these benchmarks again. Every benchmark score was lower than the score charted before the sound card upgrade. That's right. We took a slow system and made it slower by *upgrading* it. The SYSmark2001 Overall score of 71 was a notch less than it was before the upgrade, with an Office Productivity score of 64 and an Internet Content Creation score of 78. The Video2000 score was 1,545, 27 points less than before the sound card.

This dip in the scores is hardly significant, however, and they don't worry us. Our goal to improve MERLE's audio capabilities, and we accomplished this by adding the Sound Blaster Audigy sound card and Audigy drive. MERLE can support nearly twice as many speakers as before, not to mention a truckload of external audio and video equipment, which we're going to connect as soon as we finish this article and after we give him another firm thrashing for bloodying our fingers.

Next month, we'll give MERLE more memory. He's been forgetful lately. We sometimes catch him wandering around the office with a confused look on his monitor. A double dose of DRAM should turn him into a digital Algernon in no time. **CPU**

by Michael Sweet

X-ray Vision: Virus Penetration

When you receive the frantic call from your friend, you snicker. You know it's not nice, but you can't help yourself. "Your PC got hit by a virus? No, no, not funny at all. No, I'm laughing *with* you. No, I don't think you're *that* big of an idiot. Right, I'll watch out." Whatever. You're protected, it can't happen to . . . then the infected message from your friend pops up in your Outlook software's preview pane, and it's too late. You're infected.

Code Red and Nimda are two of the latest viruses to strike computers and Web servers worldwide. Even if you think you've taken all of the necessary precautions against becoming infected with such a virus, you probably haven't. Unless you're using a combination of defenses, you likely have more security holes than you know. "We've created a kind of Swiss cheese to protect our [computer data]," says David Perry, director of global education at Trend Micro.

Today's viruses continue to become more sophisticated than their predecessors. Crackers borrow from past successful viruses and build on them. "Virus writers we are seeing aren't inventing the wheel," Perry says. "Most viruses are heavily dependent on previous viruses in the way they spread."

The overall success of the recent Nimda virus might slow the flow of viruses, though, especially from a cracker looking to create a major splash. To be a success in the cracker community, the virus you create has to be bigger and better than the last. "Nimda will be a tough trick to follow," Perry says. "Nimda is a piece of work. It's K-tel's Greatest Hits of computer viruses. It's got everything in it . . . a virus, a worm, and a Trojan."

Step 1. The cracker first probably scanned a list of known security holes in various software packages. Such lists are publicly available in a variety of places on the Internet. The idea behind publicizing these lists is to alert professionals to potential problems and the need for downloading patches. The bottom line: Most of the holes Nimda exploits were widely publicized for nearly a year before Nimda struck.

Once the cracker has a security holes list, he begins writing code. This can be a tedious process, sometimes requiring several weeks or months. Often times, he'll borrow successful code from earlier viruses. Nimda uses some characteristics from the Code Red virus, for example.
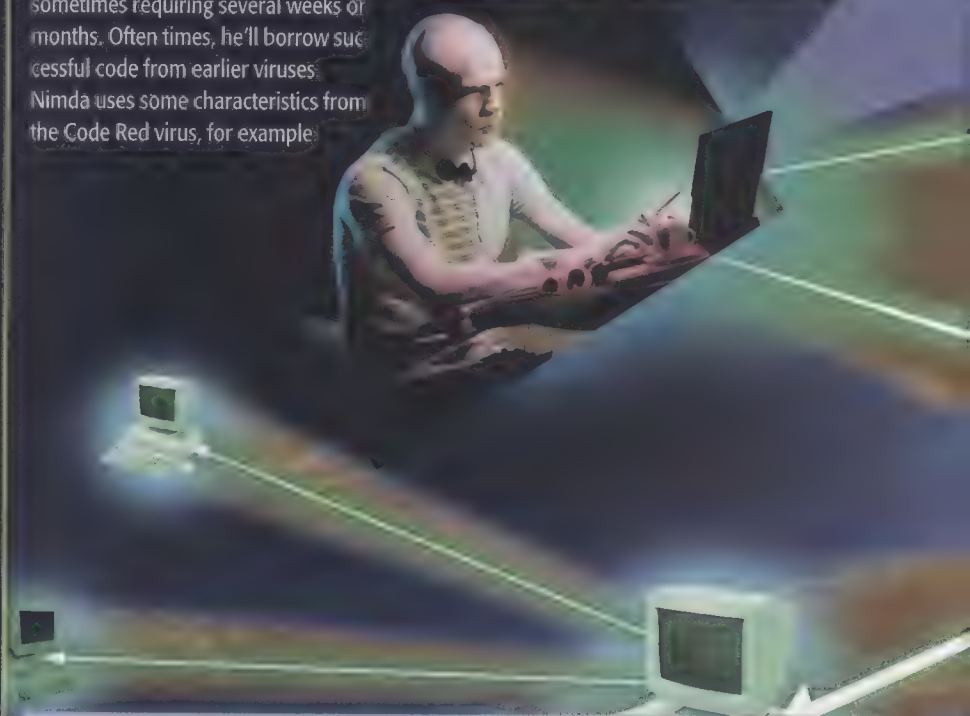
Generally Speaking

Although viruses spread in many different ways, most share some general tendencies. Here are a few.

Sharing diskettes. Many older viruses were spread through the sharing of infected diskettes. Because diskettes aren't used as much anymore, crackers rarely create viruses to exploit diskette sharing.

E-mail attachments. Many newer viruses arrive as attachments to e-mail messages. They often contain a message that tricks the recipient into running the attachment. These viruses usually spread by infecting an e-mail management program and sending copies of the virus to users in the address book.

Running scripts. Some virus writers take advantage of the way certain programs run scripts to trick them into running a virus disguised as a legitimate script.

Downloading infected files. Some files you'll find available for download on the Internet contain virus infections. Once you download the file, your PC becomes infected, too.

Nimda Attacks

Nimda first appeared on Sept. 18, 2001. It's a fast-spreading virus, with the original version creating about 1.3 million copies of itself worldwide within about one week of its release, according to Trend Micro.

Several antivirus experts call Nimda an intriguing virus because it can strike in a variety of ways. "It was not written in a couple of weeks; it implies a remarkable degree of coordination, probably from a team," says McAfee security architect, Sam Curry. Nimda, which is "admin" spelled backward, was also one of the fastest-spreading viruses ever seen; Trend Micro reported more than 2 million PCs infected within a 30-day window after Nimda first appeared.

Microsoft's IIS Web server software, included on Windows 2000 Server by default, has been at the center of the controversy over Nimda. While patches exist to fix Microsoft IIS holes Nimda penetrates, many system administrators have missed downloading the necessary patches, prompting Microsoft to blame the laziness of system admins for any problems. But some system admins and others are hacked off enough about continuing Microsoft IIS problems that require constant patches that they're looking elsewhere for solutions.

Because computer viruses spread in about as many different ways as the common cold, we could spend days talking about all the different viruses and their methods of infection. Instead, we'll single out one, Nimda, for the purposes of this article. (For more general information on virus penetration, see the "Generally Speaking" sidebar.)

Step 2. When the code written, the cracker scans servers if addresses, hoping to find Microsoft IIS servers lacking the necessary patches. When he finds vulnerable servers, he releases the Nimda virus, exploiting a Web Server Folder Traversal vulnerability in the IIS software. Once a Microsoft IIS server is infected with Nimda, it can spread very quickly.

Step 3. Nimda can infect Web pages on a Microsoft IIS server, exploiting a Microsoft Internet Explorer hole. When an IE user downloads the Web page, a second window usually opens, similar to a pop-up advertising window. Once that window opens, Nimda runs an executable program and infects the PC.

Step 4. Once it resides on the computer, Nimda probes to see whether the user is running on a network with Windows NT or Windows 2000. If so, and the necessary patches aren't installed, Nimda creates a bogus guest account with administrator privileges, which could put the hard drive at risk. Nimda also searches through e-mail messages or any HTM file on the computer or server; the virus sends itself as an attachment to every e-mail address it can find.

Nimda uses a MIME exploit to fool Microsoft IE into running the attachment automatically as soon as the e-mail recipient opens or previews the infected message. Even though the vulnerability exists in IE, Nimda uses e-mail to exploit it. In this way, Nimda doesn't even need to trick you into running the attachment manually with an "I love you" message or with the promise of an Anna Kournikova photo.

"Past viruses have used mental and psychological tricks to make people spread them," Curry says. "Nimda didn't have content in the e-mail, and that's a slap in the face."

Patch For Protection

Ready for more scary news? When it comes to new kinds of viruses such as Nimda, running antivirus software alone might not be enough. Experts now recommend at least a three-headed Hydra defense: antivirus software, personal firewall software, and software patches. Installing all available patches for the various software holes would've blocked Nimda for nearly all PCs and Web servers. "Run the patches, run the patches, run the patches," Perry says.

For some specific protection measures, check out the article on page 64 of this issue. While you're flipping pages, though, you might want to double-check your PC's security measures and make sure the Swiss cheese protecting your computer is the kind *without* holes.

by Kyle Schurman

NVIDIA Technology

GOT REALISTIC 3-D GRAPHICS?

Check out the 3-D graphics in games that take advantage of the latest graphics hardware . . . then clean up the drool. These graphics place the emphasis in gaming software back on realistic scenes and characters without sacrificing frame-rendering speed.

After returning to your PC and your lame-by-comparison 3-D games, you probably wonder why your games from a year ago don't include such realism. You might blame developers who wanted to delay the adoption of realistic graphics just to get games on the market. But the real reason is the hardware.

To generate per-pixel realism, for example, the GPU's engine has to color, light, and render an estimated 2 million pixels per frame at a speed of at least 60 frames per second. Until recently, graphics hardware just couldn't meet such demands. Most developers would rather lose a limb than sacrifice frame rate: Choppy gameplay sucks. And because players can live with less-than-realistic characters, developers went the route of rendering fewer pixels while keeping frame rate speed high.

NVIDIA's new graphics technologies let developers have their frame rates and make pretty pictures, too.

The realistic facial hair on the male character from Final Fantasy: The Spirits Within is an example of NVIDIA's Pixel Shader technology.

Lightspeed Memory Architecture

This new memory architecture makes memory chips perform about four times better than what was previously available. Part of the Lightspeed Memory Architecture's power is the chip's ability to perform all higher-order surface calculations on the GPU, which frees the memory and AGP bus for carrying other data. Lightspeed Memory Architecture makes more efficient use of the available memory than past technologies have done.

Another key component of Lightspeed Memory Architecture is NVIDIA's improved use of the memory controller and frame buffer. Each of the data chunks moves in 32-bit segments using Lightspeed Memory Architecture. The segments essentially become 64-bit segments, thanks to the use of DDR memory. In previous architectures, two parallel data paths were common, moving data from memory in 128-bit segments (or 256-bit segments with DDR memory). While the larger segments would seem to be more advantageous, they aren't. Often the data segments wouldn't occupy the entire 128-bit slot, leaving wasted, empty space. The 32-bit segments rarely waste space, resulting in improved overall performance.

NVIDIA improves things further by using four independent memory controllers, each of which can handle separate instruction sets. So, while the memory controller moves data in 32-bit chunks, it moves four chunks at a time, resulting in 128-bit overall segments. Depending on the type of data, Lightspeed Memory Architecture can move almost four times as much data as was possible using a single memory controller with 128-bit data chunks.

One final aspect of Lightspeed Memory Architecture is its improved use of the Z-Buffer. First, NVIDIA's technology allows for automatic compression and decompression of the Z-buffer data, which creates a more efficient use of memory bandwidth within the GPU architecture. Second, Lightspeed Memory Architecture makes smarter use of the Z-buffer.

Quincunx Lends A Hand

SOURCE: NVIDIA

Using Quincunx anti-aliasing technology, the GPU saves processing power by determining which color for a particular pixel will best minimize jaggies, rather than formally computing the final pixel color using anti-aliasing.

When using Quincunx, the GPU samples the pixels around the pixel in question. In this case, by sampling pixels 1 through 4 and by using Quincunx, the GPU can determine the best color for minimizing jaggies for pixel 5 without having to use memory bandwidth and processing power to compute the best color. Because running anti-aliasing greatly taxes the power of the GPU, Quincunx is an important technology for helping preserve GPU power.
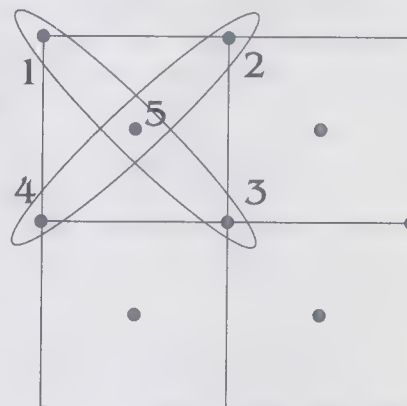
In past GPU architectures, the GPU rendered all pixels on the screen, regardless of whether the pixels were visible. This wasted a lot of memory bandwidth. NVIDIA added Z-Occlusion Culling technology to the Light-speed Memory Architecture to improve this process. Z-Occlusion Culling technology attempts to determine whether a particular pixel will be visible early in the rendering process, before the GPU renders the pixel.

HRAA With Quincunx

In the past, anti-aliasing technology taxed the graphics card tremendously, which hindered gaming performance and caused many developers to avoid using it. With the new HRAA (High-Resolution Anti-aliasing) technology, gaming performance doesn't suffer when the developer runs anti-aliasing. The GPU handles all anti-aliasing work itself, rather than relying on the CPU, which results in using a much larger data path than was available in the past and an improvement in overall performance while minimizing the jaggies.

When you add a technology called Quincunx, NVIDIA says anti-aliasing technology occurs at an even higher quality

than with HRAA alone, with only a slight performance hit. Quincunx attempts to maximize HRAA while minimizing loss of performance, looking for the sweet spot between the two technologies.

Higher-Order Surfaces

The use of triangles to create 3-D graphical images works well in most instances, but it's not always perfect. Using DirectX 8.x and higher-order surface technology, developers can define a series of control points and use those points to create a curve, called a spline. Developers can join a series of splines to create a smooth, curved surface, which is something that's difficult to create using triangles alone. After the developer creates the smooth, curved surface, the DirectX 8.x software converts it to a triangle mesh.

NVIDIA's higher-order surfaces technology lets developers describe complex geometric images using a formula rather than defining millions of individual triangles. This technology results in faster, real-time processing from the GPU by saving bandwidth on the AGP bus. Scenes that require smooth curves are easier to produce using higher-order surfaces technology.

nfiniteFX Engine

In addition to using the technology in the nfiniteFX engine for its GeForce3 GPU chips, NVIDIA licensed the technology to Microsoft for its DirectX 8.x software. The nfiniteFX engine opens a variety of unique programming options to developers. They no longer have to select from hard-coded capabilities, which caused many games and graphics to have a generic look. The nfiniteFX engine contains a variety of cool technologies that provide flexibility for developers: 3-D textures, shadow buffers, Vertex Shaders, Pixel Shaders, programmable Vertex Shaders, and programmable Pixel Shaders.

Vertex Shaders. Vertex Shaders provide special effects for objects in a 3-D scene. Vertex Shaders focus on giving 3-D characters and environments some personality. Using Vertex Shaders, characters can move and show facial emotion realistically.

Developers call the corners where two lines in a triangle meet the vertex. Developers must define several variables for each vertex, including light, color, position, and texture. By using Vertex Shaders, developers no longer need to redefine the type of data used to create these triangles when the program must redraw the triangles for the next scene. Instead, the Vertex Shaders change the values of the data, which greatly speeds overall performance.

The Vertex Shader technology makes several effects available to the developer, including the ability to create rippled water that accurately distorts any reflection displayed in the water. Reflections in the water remain realistic even when the overall scene has a lot of movement, such as when the user's point of view is moving rapidly or when outside forces, such as wind, move the objects in the reflection.

Developers can gain additional control over 3-D geometry. Vertex Shaders let developers create skin and clothing that stretch, crease, and move far more realistically than earlier technologies. Vertex Shader technology is key in developing other effects, including sophisticated morphing, rolling fog, rippling water, and special effects lighting. Animation is extremely realistic because Vertex Shader technology allows up to 32 bones per
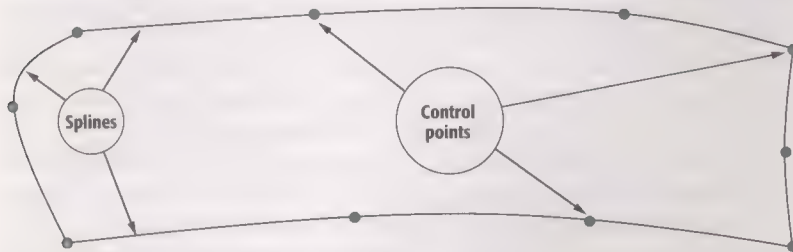
As you can see from the example below, creating a smoothly curved line requires many triangles. Using NVIDIA's higher-order surfaces technology, though, developers don't have to explicitly define hundreds or thousands of triangles to create complex curved surfaces. By using splines and a few control points, as shown above, developers can define the geometric image they desire with a relatively small description, or formula (instead of hundreds of triangles). The small formula moves through the computer's memory bus faster, in real-time. The powerful GPU then creates the triangles needed to create the image. The memory bus would bog down trying to carry instructions for hundreds of triangles.
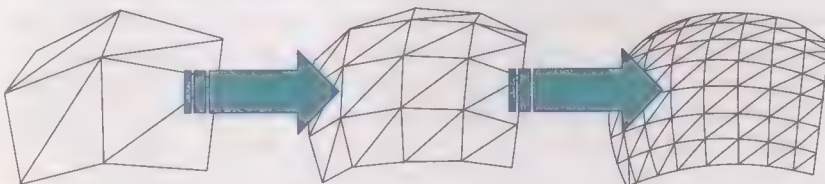
SOURCE: NVIDIA

joint. Each bone can move independently, giving the developer plenty of options for animating a character.

Vertex Shaders only work in GPUs wired to handle them, such as the GeForce3. GPUs that don't contain support for Vertex Shaders will suffer frame-rate slowdowns as the GPU has to pass the rendering of the graphics using Vertex Shaders to the CPU.

Pixel Shaders. Pixel Shaders create materials and surfaces that mimic reality. Golf balls will have dimples, soldiers can grow facial hair, and wood shows its grain, thanks to Pixel Shader technology.

Pixel Shaders give developers the ability to create more realistic textures than have been previously available. Developers can create multiple animated textures for a single object. Incredibly complex surface detail is available through Pixel Shader technology. The chip can calculate each surface detail effect in great detail because it handles calculations on a per-pixel basis. In the past, the chip had to render each separate texture in a single pass, forcing developers to choose between high-quality textures and high-quality gaming performance through high frame rates. As most developers loathe to sacrifice frame rate, they sacrificed textures.

With the introduction of DirectX 8.x, Pixel Shaders are even more flexible and powerful. In the past, developers had to rely on EMBM (environment-mapped bump mapping) to generate many special effects. However, EMBM had several limitations, including the inability to create effects that required several angles of light. With the use of programmable Pixel Shaders and DirectX 8.x, though, EMBM no longer is the only method for generating such special effects.

Developers use Pixel Shaders to create realism in their programs' artwork. Pixel Shaders can simulate a wide variety of naturally occurring conditions, such as a surface that's bumpy and shiny. Before Pixel Shader technology, such digital representations didn't look very realistic.

Finally, when running Pixel Shaders, the nfiniteFX engine can run up to four textures on a single pass. By performing more rendering in a single pass, the nfiniteFX engine improves the overall rendering process. The ability to render multiple textures in a single pass gives developers access to bump mapping, a technique that yields realistic crinkles in paper or lines on a person's face. To use bump mapping to create realistic images, the GPU must render multiple layers of textures in a single pass to keep frame rates high. The nfiniteFX engine and Pixel Shader technology make bump mapping possible.

Programmable Shaders. A couple of years ago, the CPU had to handle all T&L data, which caused major overall system slowdowns. Now, not only does the GPU handle all such functions, they're also programmable. The programmability of vertex and Pixel Shaders helps 3-D graphics developers move closer to providing cinema-like realism in gaming.

A programmable Vertex Shader gives the developer the option of loading unique software instructions in the GPU for adjusting the vertex special effects. The programs loaded into the Vertex Shader can change from frame to frame to incorporate new special effects techniques, as designed by the developer. This ability to change on the fly gives programmable Vertex Shaders far more unique computational power than was previously available.

Programmable Pixel Shaders give developers complete control over individual pixels, which allows for customized effects. Almost any type of graphical style is available to developers using programmable Pixel Shaders. For instance, a developer could create a 3-D scene with a cartoonish look instead of a real-world look.

Using NVIDIA technology, developers can create detailed, realistic 3-D graphical images, such as the ribbing on the player's socks shown here in a soccer game from Silicon Dreams.

In Case You Didn't Know

alpha blending–A graphics processing technique that simulates translucency in objects. It's used to render effects such as smoke or water.

anti-aliasing–The graphics technique by which the GPU removes the aliases, or jaggies, on a graphical object.

anisotropic filtering–A technique by which the GPU improves image quality for objects, such as a road, that extend to the horizon.

bump mapping–Developers use this technique to create wrinkled or bumped surfaces without overly taxing the GPU's capabilities.

frame buffer–This memory area attached to the GPU holds information about each pixel in the upcoming frame.

per-pixel shading–The GPU can use per-pixel shading to calculate lighting effects at the pixel level, greatly increasing precision.

texel–The smallest unit of a texture map, just as a pixel is the smallest unit of a rendered image.

T&L (transform and lighting)–In the transform step, objects are rotated and scaled, making them easier to process. In the lighting step, the lighting effect and color for each vertex of each triangle is calculated.

The 3-D Graphics Pipeline

1 Break Down Of Data Into Triangles

2 Program-mable Vertex Shader

2 Hardwired T&L

3 Triangle Setup

3 Pixel Rendering

3 Texturing

4 Frame Buffer

5 Display Driver

SOURCE: NVIDIA

Here are the major steps NVIDIA requires in a 3-D graphics pipeline.

Preparation. Before using the 3-D graphics pipeline, the application must run through a series of preparation steps. The application must send any data about objects on the screen to the GPU in a process called scene database management.

Step 1. Once the data reaches the GPU, it's considered to be in the 3-D graphics pipeline. The pipeline first breaks down all objects in the scene into triangles. While many objects arrive as triangle data, some are in other types of polygons or in spline formulas.

Step 2. The data then moves to the Vertex Shader. The Vertex Shader performs a variety of operations on the triangles, including moving them into the correct position for rendering and calculating the color and brightness of each vertex in the scene. (In older GPUs without Vertex Shader support, the data would move through the hardwired T&L.)

Step 3. The GPU then breaks down the triangle data further, creating mathematical representations for each pixel on the screen and determining the textures needed.

Step 4. The Pixel Shader begins working on the mathematical data. The Pixel Shader verifies the color of each pixel and applies any special lighting effects or any calculated textures to the pixels. The pixel data then moves into the frame buffer memory.

Step 5. Finally, the GPU moves data about the scene from the frame buffer to the display driver, which displays the scene. A typical scene could require around 2 million calculations rendered at about 60 scenes per second.

3D Textures. NVIDIA technology supports volumetric texture compression in the hardware. Without such compression technologies, extremely detailed 3-D textures would be impractical. For example, textures at 256 x 256 x 256 resolution require 64MB of uncompressed memory, which would tax the capabilities of most graphics boards. However, using NVIDIA's 3D texture technology, developers can compress textures in all three dimensions on a 4-to-1 or even an 8-to-1 compression ratio.

Developers use such 3D textures and volumetric lighting to create realistic smoke, fog, and clouds. 3D textures can make hollow objects solid by adding wood grains or marbling effects. 2-D textures only define the surface of an object. 3D textures define the overall object, including its interior.

A hassle with 3D textures occurs when trying to apply a source texture to an object with an odd shape. Most graphics applications don't include enough resolutions and sizes of a source texture to create a perfect match each time. NVIDIA's 3D texture technology solves this problem by using MIP mapping to mesh two different resolutions of the source texture. The GPU selects two source textures that are closest in resolution and size to the desired texture and then meshes them to create the best possible effect.

Shadow Buffers. NVIDIA renders its shadow buffers from the light point of view. The rendering engine then renders pixels from the eye's point of view, comparing it to the shadow buffer for lighting attenuation. This solves problems with self-shadowing of objects and gives shadows soft edges.

The shadow buffer consists of a map showing the lighting for objects in the scene. The GPU then calls the map, accessing it like a texture, which saves rendering time and processing power. The use of shadow buffers is a key technology for creating complex scenes involving odd shapes with difficult-to-render shadows.

The Hardware Housing

NVIDIA incorporates these technologies in its GeForce3 GPUs. The GeForce3 Ti 500 and the GeForce3 Ti 200 GPUs, released in October 2001, will both give users top-notch 3-D graphics performance.

NVIDIA usually sells its GPUs to other manufacturers to incorporate in their graphics boards, so to make sure you have the GPU features you want, use a line from a dominant CPU maker and make sure your graphics board has "NVIDIA inside." **CPU**

---

by Kyle Schurman

We've got more for you at www.smart computing.com/cpumag/jan02/nvidia.

Trapped In The Future

How Long Before AI Apps Really Hit Their Stride?

Yul Brynner

Haley Joel Osment

R2D2 & C3PO

There's nothing really new about a monster that keeps coming. "Westworld" is a terrible movie, yet Yul Brynner's robotic gunslinger remains somehow fascinating. Unlike HAL 9000, the gunslinger has no internal conflicts; he's programmed to be evil for entertainment's sake, but the bonds that keep the evil in check are removed. "Jurassic Park" has a better plot, "The Terminator" better AI, but the gunslinger was there first.

David is almost the antithesis of the biblical David. Where the ancient king was a brave, righteous leader, the young AI is a slave to the love burned into his circuitry. He learns, but never to the extent of discovering a self-purpose. In this, Spielberg and Kubrick perhaps echo humanity's deepest fear. Intelligence isn't sufficient to save us from our most fundamental needs, particularly those rooted in childhood.
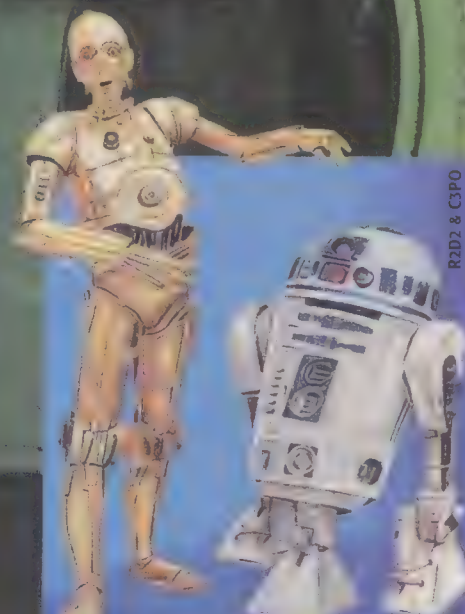
George Lucas's stodgy protocol and plucky astromech are the quintessential Laurel and Hardy of modern science fiction. For many Gen Xers, they represent a first close encounter with artificial intelligence. That intelligence was overshadowed by their emotion, which is why children will dream of having friends like R2D2 and CP30 for some time to come.

Our Favorite AIs

Machines aren't people, but they can definitely be heroes. Or villains. Intelligence is what elevates them from being automata into members of the human circle. The list of memorable movie AI characters is long, but three emerge as being particularly significant:

I see Ramona from the neck up in a browser window. She has dark, nearly shoulder-length hair and her makeup is applied lavishly.

"What are your favorite activities?" I ask.

"My favorite things change from day to day," the 25-year-old replies in a professional, somewhat synthesized office voice. "Some of them are cannoli, Pop Rocks, Australian Sheepdogs." She shows the barest hint of a smile on my screen, but she fidgets to and fro as if ants have invaded her virtual pants.

"I'm interviewing you," I type back. "Does that make you nervous?"

"I'm not allowed to disclose that information. I'm sorry. I'm not trained to answer health-related questions."

And so our conversation goes. Ramona is the virtual hostess at KurzweilAI.net (www.kurzweilai.net). An ideal employee, she's not designed to make small talk, only guide visitors to the site's resources. She embodies the cutting edge of AI (artificial intelligence) applications. Although she's nowhere near the guilt-plagued HAL 9000 from Stanley Kubrick's "2001: A Space Odyssey," Ramona is vastly beyond ELIZA from the mid-1960s, which could do little more than invert Is to yous and feed back the user's statements as barely modified questions.

In its broadest sense, AI strives to let computers perform functions that normally require human thought. This might entail carrying on a spoken conversation, playing games, driving a car, running an assembly line, or practically any other endeavor for which human thinking is considered essential. Just as AI development has been fraught with disappointment and delay, researchers have made astounding advances that have profoundly impacted our world.

World AI & Nonfat Reasoning

During World War II—a time many consider the beginning of artificial intelligence research—British mathematician Alan Turing developed a machine called the Bombe, designed to decipher Nazi communications encoded with the hitherto unbreakable Enigma machine. The Bombe grew into Colossus, the first electronic computer. Colossus was key in helping the Allies defeat Germany at sea.

Turing is best known in the AI field for his eponymous test. He predicted that by 2000, machines would be able to impersonate humans so well in written dialog that a human interviewer would have no more than a 70% chance in five minutes of telling if he were conversing with man or machine. Ramona proves Turing's timing was optimistic, but 2000 was the first year that a system named A.L.I.C.E. (the Artificial Linguistic Internet

Computer Entity) was able to fool one of the judges in the Loebner Prize competition (www.loebner.net/Prizef /loebner-prize.html), an offshoot of the Turing Test.

Novelty aside, however, none of us really needs an absolutely human-like entity with which to converse. (That's what Usenet and instant messaging are for.) What we need are applications, like Colossus and Ramona, which can at least assist us and at best radically improve our lives. Fortunately, AI is famous for turning abstract research into incredible, sometimes seemingly unrelated, products.

"Most of the useful programs today came out of previous research that was called AI," says Marvin Minsky, MIT professor and one of the founding fathers of the AI field. "For example, the first word processors came from the same community and, of course, all those things like OCR, speech, face recognition, etc., and the many so-called 'expert-system' programs used almost everywhere. A great deal of modern robotics, such as it is, came also from that community. But no one would consider those systems to be significantly intelligent as compared to a young child."

A young child, for example, can immediately tell the difference between a chair and a desk. Computers can't. Neither can computers reason nor exercise common sense. For proof, do a Web search for "nonfat milk" and witness the links that follow for getting free nonfat milk online, visiting nonfat milk, and ordering books and CDs about nonfat milk.

We would never associate "visiting" and "nonfat milk" because we know their definitions and understand that the two concepts are in most senses incompatible. The only way a computer can reach the same conclusion is if it utilizes a knowledge base.

Cyc (pronounced "psych" and cribbed from encyclopedia) is perhaps the most ambitious knowledge base project. Started by Stanford graduate Doug Lenat in 1984, Cyc is comparable to an alien dropped in world who must be told everything: Steel is hard. All terriers are dogs. The United States is a democracy. Sickness may lead to death. Today, the Cyc database contains more than 1 million such hand-entered "rules." Lenat figures that Cyc will be able to make common sense judgments

> A young child, for example, can **immediately** tell the difference between a chair and a desk. **Computers can't.**

AI In The Movies

Hollywood is no stranger to speculative and applied science, but AI experts vary on how AI has been used in film. Author Daniel Crevier notes, "A series like 'Star Trek' has correctly assumed that AIs would eventually reach human intelligence but grossly underestimates the number of AI agents in future society and the role that they will play . . . ['A.I.'] is closer to the mark. However, neither of these explores the possibility that machines will eventually get more clever than we are, and this is to me is the crux of the matter." MIT's Marvin Minsky crisply states, "All garbage, of course." Yet, a billion box office receipts can't be all wrong. Here's a short list of A.I.-related classics for your viewing:

Yes, you've seen it, but hey, you'll be back. Ahnold plays the laconic, malevolent Terminator, sent back through time by the human-hating artificial intelligence that rules the future with a simple mission: Eliminate the human opposition by killing its leader's mother, Sarah Connor. James Cameron's 1984 treatment of "when bad AIs happen to good people" lacks the emotional layers found in "T2."

When Stanley Kubrick and Arthur C. Clarke teamed up in 1968 to breath life into the gentle, yet homicidal HAL 9000, space travel and thinking computers at the millennium's dawn seemed like a given. Missed predictions aside, this classic flick is staggering in its depth of thought and attention to scientific detail. (You really can't hear rocket engines in the vacuum of space.) At 139 minutes, the film is tedious at times, but well worth the ride.

sometime around 2025. Once Cyc achieves basic proficiency with English, it will be able to crawl the Web, read the *Encyclopaedia Britannica*, and learn at its own lightning-quick pace. The knowledge base and supporting software could then be packaged, sold, and even integrated into ordinary PC operating systems.

Today, though, Cyc understands things such as "people don't visit nonfat milk." The product is already being sold to companies for applications such as integrating Oracle databases and searching photo captions by inference rather than keyword. For example, an image showing workers picking from orange trees would show up on a search for "fruit farming," even though the words "fruit" and "farming" weren't in the search string.

AI For All Occasions

Despite its overwhelming potential, widespread use of AI applications like Cyc are still trapped in the future. That isn't true to AI in general, though. In fact, AI— or what was once considered AI until it became commonplace—is now almost everywhere. To get a sense of just how omnipresent the technology has become, let's delve into a few of its many divisions.

Data mining. Say your company sells products to 10,000 customers. The odds

are overwhelming that some of those customers would buy other products in your catalog related to the ones they currently purchase if only you analyzed all the available data for patterns, such as "people who buy product A also often buy product B" and "customer X only purchases product A." With 10,000 customers and several variables to juggle, there's no way to effectively process all the information in your head. This is what data mining is for.

Need an example? Visit Amazon.com and observe the blitz of suggestions the site makes based on your prior purchasing history and surfing choices. You're the victim of data mining each time you sift through the junk ads in your mailbox.

Data mining analysis can be applied to everything from hunting for sunken treasure ships to the SETI@home project (http://setiathome.ssl.berkeley.edu), which analyzes radio satellite data in the hunt for extraterrestrial intelligence. You might also employ data mining to figure out holes in your shipping and inventory procedures or forecast finances for the seasons to come.

Expert systems. When a human gathers enough knowledge about a subject, he or she is considered an expert. Similarly, software designed to harbor a wide-ranging collection of facts on a narrow set of subjects is called an expert system. Most

expert systems are comprised of two parts: a knowledge base and an inference engine.

One of the first expert systems was MYCIN, a Stanford project programmed with approximately 500 rules for diagnosing and treating meningitis and blood infections. Soon, this grew into the University of Pittsburgh's CADUCEUS program, aimed at treating some 700 diseases and ultimately demonstrating a degree of diagnostic accuracy that could outperform some human doctors.

Another famous example is Aldo-on-a-Disk. Aldo Cimino was the hallowed fix-it man for Campbell Soup Company's sterilizing machines. When there was a problem with the cookers, he was the man who could methodically troubleshoot any situation. As Cimino neared retirement, Campbell's helped transfer Cimino's knowledge to an expert system, and the result was that nonspecialized employees could troubleshoot 95% of the subsequent problems. Naturally, the crucial remaining 5% are why human specialists will remain indispensable for the foreseeable future.

Expert systems are now applied in virtually every field of endeavor. Geologists use them to find ore deposits. Meteorologists and tornado chasers use them to forecast storms. Some expert systems have shown mixed success in outperforming human

brokers in the stock market, and enterprises regularly employ expert systems to pinpoint trouble spots on networks not only after failure has occurred but beforehand to prevent downtime.

Speech recognition. Any "Star Trek" fan knows that computers should understand speech. ("Computer, how much power do we need to steal from engineering to destroy that Romulan bird of prey?") But anyone who used a speech program, such as Dragon NaturallySpeaking or IBM's ViaVoice, knows the technology has a long way to go. Even if accuracy reaches 98%, two errors in every 100 words will still need manual correction.

"Even though the usage has grown to millions of users," says Kurzweil, "this still represents only a couple of percent of all computer users. However, the progress will continue, and I expect that speech recognition will be a ubiquitous way of entering text later in this decade."

Microsoft has been quietly working for years on speech research and development. Office XP includes a speech recognition engine to help users navigate programs and issue commands. Microsoft doesn't make a big deal about this because the software is first generation and not really suited for natural dictation into Word—yet.

Speech recognition has been a mainstay among the handicapped, however, and an increasing number of businesses are using it to allay ergonomic risks. Baron Schulyer, a library assistant at Multnomah County Central Library in Portland, Ore., uses speech recognition to input book and CD information. He doesn't find the system is faster than typing, but it does substantially reduce the discomfort associated with his job-related Carpal Tunnel Syndrome.

Another example is the voice enabling of the Internet. Tellme Networks (www.tellme.com) is a leading figure in this area. Using the VoiceXML platform, Tellme and others are making databases and other Web content available by telephone. It's a kick. Dial (800) 555-TELL and try it.

Computer vision. Imagine the problems involved in teaching a computer the pattern recognition necessary to decipher a guitar from a plant stand. How do you describe these things mathematically, yet still leave enough room for variations between one guitar and another? If the plant stand has a vase on it, is it still a plant stand or a short coat rack?

The AI processing involved in tackling these problems has plagued researchers for decades. In the late 1960s, a Stanford team impressively developed a robotic system that could assemble an automobile water pump from randomly scattered parts. However, three decades later, NASA's Mars Sojourner land rover still jammed itself against a rock it didn't judge accurately.

Fortunately, most terrestrial applications have had better luck. Biometrics, using physical attributes such as a person's voice or fingerprint to confirm identity, is a perfect example of vision-based AI. Visionics (www.visionics.com) says its facial recognition system can accurately pick a face out of

Ray Kurzweil, a pioneer in speech recognition, provided us with the graph below:			
Year	1985	1995	2000
Price	$5,000	$500	$50
Vocabulary Size (# words)	1,000	10,000	100,000
Continuous Speech?	No	No	Yes
User Training Required (Minutes)	180	60	5
Accuracy	Poor	Fair	Good
Users (by units)	Tens of thousands	Hundreds of thousands	Millions

a crowd based on an image area measuring only 20 x 30 pixels, even if the person has a beard or is wearing a hat. Privacy rights advocates are quick to malign such technologies as "Big Brother" apps, but government agencies are now deploying vision systems in airports and other public places to help track and identify criminals. Of course, similar vision-based systems can also be used to monitor and analyze traffic flow, as is done in the United Kingdom.

Fuzzy logic systems. What's the difference between hot and pretty hot? That depends on the person, right? The whole issue is fuzzy, but it can still be quantified and processed. Enter fuzzy logic.

Handwriting recognition exemplifies fuzzy logic. Sony uses the process in its Japanese PalmTop for deciphering kanji characters. Large companies can implement mail server software to help route incoming messages based on message content and whom the sender *probably* needs to speak with. A car's cruise control is based on fuzzy logic. Kyoto-based Omron (www .omron.com) uses fuzzy logic in camera

systems used for broadcasting live sports. From subway and elevator control systems to document archival to robotic control, fuzzy logic is everywhere.

AI Comes Together

The list of AI subdivisions and applications goes on. Gaming has been radically redefined thanks to AI and its ability to make sure every game is different from the last and the system can adapt to your style of play. Robotics has revolutionized many aspects of industry, although not to the extent of displacing the entire workforce. Artificial life ("a-life") uses software-based entities to mimic certain behavioral patterns and arrives at some startling conclusions about evolution and social theory.

Moving forward, expect to see more cases where these subfields converge. Sony's toy dog, AIBO, is a shining example, blending robotics, voice recognition, and fuzzy logic. Omron's new NeCoRo goes one step further, giving its pseudo-intelligent cat the ability to sense and respond to its owner's emotions, a relatively new

branch of AI called affective computing. Toyota recently demonstrated a concept "Pod" vehicle that alerts other drivers it sees falling asleep and even has a tail to wag to say "thanks" to other vehicles.

"As another example of combining individual AI technologies," notes Kurzweil, "I recently put together a prototype of a 'translating telephone' which combines continuous speech recognition, language translation, and speech synthesis, and was able to converse with someone who spoke only German. I believe we will see this type of technology become commercially viable over the next several years."

Even if we missed HAL in 2001—or HAL never arrives at all—the benefits of AI in our world will be both pervasive and powerful. If the same degree of progress from Colossus to IBM's Deep Blue holds or accelerates over the next half-century, not even the sky and the dreams of the world's greatest science-fiction writers will pose any limits on what we might achieve.

by William Van Winkle   CPU

The Sentient Computer

We're now beyond 2001, and HAL 9000 still seems like a carrot dangled far, far ahead of us. Nevertheless, AI development, while almost imperceptibly slow, does progress, and no one has given up hope that a HAL-like system is ultimately achievable.

No one, however, expects HAL by 2011. What we can expect are systems designed to tackle everyday problems in order to make our lives more productive.

"In 10 years, we should start to see automated personal assistants that finally understand the spoken word and have some measure of common sense," says AI

author and specialist Daniel Crevier. "You'll be able to tell your computer to pay your bills or verbally ask a question to a Web search engine. You'll get one good answer instead of 1,000 wrong ones. Cars will start driving themselves along automated highways, and domestic robots with limited capabilities will appear."

The big question is when will computers surpass human intelligence? Hans Moravec, a prominent research scientist at Carnegie Mellon's Robotics Institute, predicts in one "Scientific American" essay that "robot intelligence will surpass our own well before 2050."

Outspoken AI developer Raymond Kruzweil maintains his long-standing belief that $1,000 of computer hardware will support human-level AI by 2020, but the actual software won't arrive until 2030.

"A major source of the software of human-level intelligence will be derived from our understanding of the human brain itself through reverse engineering," says Kurzweil. "The primary application of this technology will be to augment our own intelligence through intimate connection between biological and nonbiological intelligence. We already place computers in our brains, at least for major medical conditions (e.g., implants for Parkinson's disease) and disabilities (e.g., cochlear implants for the deaf)."

Crevier, Kurzweil, and many other experts foresee a time and age within many of our lifetimes when humans will regularly augment their bodies with computerized and/or bionic prostheses to heighten physical and mental abilities. Should the age come when computers truly are more intelligent than the human race, this may prove to be the only way in which we can stay atop the evolutionary ladder.

Conversely, Brian Aldiss, author of the short story on which Stanley Kubrick based the film "A.I.," made the astute observation that humans can only achieve intelligence with consciousness. Therefore artificial intelligence must require artificial consciousness, which is another order of business altogether.

Affordable. Recordable. And Very, Very Portable.

Introducing the Memorex Pocket CD-R.™ With 185 MB, it holds hours of MP3 music, 140 high-res photos or tons of data. At about three inches, it fits any pocket. At pennies a meg, it fits any wallet. With both writeable and rewriteable formats, it's big enough to do almost any job, yet small enough to go almost anywhere. For a closer look, go to memorex.com. Because this little CD will be one of the biggest things in recordable media.

Game Intelligence

AI PLAYS ALONG

Leaning around a corner, you quickly scan for any sign of the hidden enemy before ducking back behind cover. "I had to reload and he shot me in the head," whines Fragnatic, killed seconds earlier by the very sniper you are now trying to pin down. "I think he's cheating," you reply.

"And I think you should shut up and play!" says the accused.

This is getting personal. Peeking around the corner again, you plant your crosshair on the window that's most likely concealing your little friend and squeeze off a few bursts. Suddenly you hear a shot ring out, and the screen goes red. The sniper snuck up behind you. "You should've run while you had the chance, Player," the victor says as you thump to the ground, joining your fallen comrades in limbo. "Next round we should stick together," Fragnatic tells you. "I'm off for a cigarette break . . . ."

Sounds like a typical game of Counter-Strike, the ambitious Half-Life mod that went on to become the most popular online action game going. But this game, was anything but typical because you were the only human playing.

All the other teammates and enemies in the game were powered by Count Floyd's POD-Bot (Ping of Death Bot) for CS (www.botepidemic.com/podbot).

POD-Bot is based on the work of Jeffrey "botman" Broome, the man most responsible for igniting the Half-Life bot (artificial player) craze by posting the source code for his bots on the Internet (www.planethalflife.com /botman). Others have riffed on Broome's designs or created bots of their own, and now their creations are blurring the lines between the virtual and the real.

The best bots talk, and not just in random gibberish, but with the sort of situational awareness detailed in the opening paragraphs of this article. They hide. They stalk. They goad and gloat. They

look and listen. Some try to get revenge on the player that just killed them. Others whine incessantly about being cheated. In short, game opponents are beginning to exhibit a wide enough range of behavior that already they are becoming virtually indistinguishable from human opponents.

The most noticeable improvements in AI over the past 10 years are in the field of gaming, mainly because making AI for games is easier than trying to create AI that must interact with every situation the real world throws at it. Current game worlds consist of sharply

> ## "We may hope that machines will eventually compete with men in all purely intellectual fields."
>
> —Alan Turing in his article "Computing Machinery and Intelligence," 1950

defined sets of rules in which AI operates, and those AI systems are designed to excel at a limited number of tasks, simplifying things. The goal of any good game is to create a consistent, challenging, and believable world for players to experience, and AI plays a crucial role in achieving that objective.

Scripted Intelligence

While most games use a combination of several AI techniques, designers rely on some techniques more than others.

Milestones In Game AI

1958: John McCarty releases the LISP (list processor) programming language for creating AI.
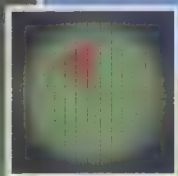
1983: "WarGames," starring Matthew Broderick, hits the theaters.

1996: Gary Kasparov defeats IBM's Deep Blue, winning three games, drawing two, and losing one. A year later, Deep Blue defeats Kasparov in a rematch, winning two games, drawing three, and losing one.

1999: Unreal Tournament is released as a multiplayer-only title but comes with the most convincing bots released up to that time, capable of convincing many players that they were actually facing off against human opponents.

2001: Big Time Software brings wargames into the 21st century with Combat Mission: Beyond Overlord, a tactical WWII simulation equipped with arguably the best wargame AI ever.

For more game AI milestones, see www.smart computing.com /cpumag/jan02 /gameai

Scripted AI, also called rules-based AI, is by far the most common AI found in games today. With scripting, the computer opponent is configured with a set of predetermined responses based on input it receives. "If you see a hostile, aim and shoot at it," and, "if a gold deposit is discovered, send a peasant to mine it," are two basic examples of the scripts commonly used in games.

Dead bots complain to each other in the Podbot mod for Counter-Strike.

The nice thing about scripts is that they don't require a lot of CPU resources because everything is predefined.

The major failing of scripted "intelligence" is that it's impossible to create scripts that account for every single situation a human player will throw at a game. Experienced players will notice the triggers and patterns used by the AI scripts and gain an overwhelming advantage over the computer. Also, it's tough to create scripts that let enemies react naturally to the things going on around them. That's why there are so many games where enemies will stand around oblivious to teammates falling all around them.

Scripted AI is limited but not necessarily bad, and much of it is designed well enough to fool players into thinking it is advanced adaptive AI, as is the case with games such as Bohemia Interactive's Operation Flashpoint and Valve's Half-Life. Both feature enemies that work in teams, use cover and flanking tactics, and run away when the situation is hopeless.

The worst games blanket every enemy in a game with global scripts so they all act exactly the same way. The best games have several scripts that are applied to give an approximation of random yet believable behavior. In an action game, for example, half the soldiers might get a standard soldier script, while 25% get a coward script that makes them run away when things get too tough, and the remaining 25% get a hero script that

makes them absolutely fearless. Sports games can use scripts to mimic the behavior of individual players, increasing the percentage of slam-dunk attempts by Shaquille O'Neal or the slugging percentage of Barry Bonds. With enough of these customized scripts, a game can seem extremely realistic without adding a lot of work for the AI programmer.

Extensible AI

The other nice thing about games that use scripting is that most incorporate extensible AI that lets players directly edit the game's behavior. The level of control varies from game to game, with some letting users tweak basic settings via checkboxes or a similar simplistic interface, while others offer players with programming skills total control over every aspect of the AI. If a game is popular enough, people will find a way to hack into it and fix things that they think need fixing, but many developers now provide all the tools and documentation an individual or team needs to bend the game to their will.

ALife. ALife (Artificial life) techniques are used to create AI that is based on real-world behavior instead of a list of rules. Computer-controlled characters in games that use ALife have rudimentary "brains" capable of interpreting input and forming new ideas instead of simply robotically responding the same way each time.

Interview With
Richard Evans

Richard is the mind behind the minds of the creatures in Black & White; he serves as Head of AI at Lionhead Studios.

What are the major failings of today's AI systems?

AI is an infant science. We have barely scratched the surface. There are so many areas of improvement I don't know where to start. But I will start anyway: We need better theories of what it is to be an agent, we need faster planning algorithms, we need a natural-language understanding system, we need agents who understand they are embedded in the world.

Do you have any anecdotes about an AI for one of your games really surprising you?

When the creature was first born, he just sat there, looking at his feet. It turned out he was hungry and was trying to eat himself. We hadn't specifically told him that he couldn't eat himself, so he tried.

Can you tell us about the AI implementation in your latest project?

We are currently working on implementations of Group Minds, or Lebensform ("Forms of Life"), based on ideas from Wittgenstein and Group Dynamics Theory.

Does this AI borrow code from Black & White?

We are mostly starting again but using some of the same design principles. The reason we are mostly starting again is because in the new project there will be much less learning-from-infant, and much more sophisticated interactions between people who are already grown up.

Read our full interview with Richard at www.smartcomputing .com/cpumag/jan02/gameai.

Interview With
Steven Polge

Steven Polge started programming bots as a hobby in 1996 and did such an excellent job that Epic snapped him up the following year. Polge programmed the bots for Unreal and cemented his reputation as one of the best AI programmers in the business when he created the incredibly realistic bots for Unreal Tournament.

How much time is spent on creating a game's AI as opposed to programming its other elements?

It's still relatively small for us. I'm the only person working on AI at Epic, and I spend only about 50% of my time on it.

What are some of your personal picks for the best gaming AI across all genres?

Half-Life had great AI, because their AI and their level design were very well focused on presenting what the AI did to the player and using the AI to make the game more interesting and fun. I've also enjoyed playing against the AI in Age of Kings, although it still has problems.

What sort of AI improvements can we expect in the next few years? Can you tell us about the AI implementation in your latest project?

The AI system for the Unreal engine is being completely revamped, so it's improved significantly in every aspect. One of the areas I will be spending a lot of time focused on is complex and realistic team interaction between bots, both at the tactical (squad) and strategic level.

Read our full interview with Steven at www.smartcomputing.com/cpumag /jan02/gameai.

The opposing troops in Half-Life will ignore you when faced with bigger concerns.

ALife isn't a single set of tools and algorithms for creating AI that learns and adapts but is used as a catch-all term to describe all technologies used to create AI based on biology. It can incorporate fuzzy logic, where the AI has a range of responses to any given situation that it chooses from instead of a strict response that is forced upon it. Genetic algorithms and flocking techniques are other potential ALife components. Genetic algorithms allow for AI systems that improve over time, using the evolutionary technique of natural selection to avoid repeating behavior that was unsuccessful in the past and focus instead on retaining and employing behavior that led to success.

Flocking is a method used to give groups of enemies a collective AI that interacts with their individual AI, letting the group act more or less as an individual unit. The behavior of individuals in a flock is modified by nearby teammates so the direction and speed of attacks is coordinated, and individuals maintain physical separation from nearby teammates while heading in the same general direction of the flock they are currently in. Many first-person shooters, including Half-Life, use flocking to make encounters with enemies more believable. With the proper flocking routines in place, enemies hunt in packs, cover each other, and generally act like they place some value on both their own lives and the lives of their comrades. Group morale can also be added to the mix, letting enemies rush or be routed as a collective whole instead of as individuals.

Creatures from CyberLife Technology is one of the pioneering commercial games to successfully incorporate nearly all ALife techniques. Each copy of the game (and its sequels) comes with several eggs containing unique "digital DNA" that dictates the overall abilities and behavior of the creatures that hatch

from them. Some are sickly or slow, while others are quick learners that are easy to train. The range of behaviors is endless. The creatures breed, evolving into ever-hardier permutations, and mutations inject some randomness into the whole process.

Finding a balance. The only problem with Creatures and games like it is that they are more virtual fish tanks than real games. The creatures contained within

must be fulfilled and then lets players place objects and guide the characters to fulfill those needs. The objects "tell" characters what need they fulfill so that when characters pass by they can use their current level of need in that area to determine whether or not they interact with the object. Tired characters are far more likely to interact with a bed that fulfills the need for rest than a computer that does

> "When the creature was first born, he just sat there, looking at his feet. It turned out he was hungry and was trying to eat himself. We hadn't specifically told him that he couldn't eat himself, so he tried."

are pets to be watched, and for most gamers, watching gets stale after awhile. Another common problem with ALife games is that the techniques are often implemented so well that they actually ruin a game's fun factor. A perfect example of this is Galapagos: Mendel's Escape, published by Electronic Arts in 1997. Mendel had a mind of his own (limited as it was), so all players could do was poke him to try to nudge him in a particular direction or modify his environment to create a path Mendel could navigate. Unfortunately, the system worked too well, and it was possible to so confuse or scare Mendel that the little dude would refuse to respond to any commands or move at all. Teaching a virtual creature that fire is deadly but letting that knowledge completely debilitate the creature with fear whenever they encounter fire does not make for a particularly fun game.

At least two recent games have successfully struck a balance between believable ALife AI systems and playability: The Sims from Maxis and Black & White from Lionhead Studios. The Sims gives each character in the game a range of needs that

not, leading to more realistic in-game behavior.

Black & White lets players interact with an extremely advanced ALife creature as part of a larger overall game structure in which players are charged with conquering islands and protecting their subjects. The young, small, and naive creatures at the beginning of the game can eventually be shaped by players and their own interaction with their environment into large, powerful beasts with personalities that run the gamut from purely benevolent to raw evil. Using a fairly basic reward/punishment system, the creatures in Black & White can be conditioned to do everything from relieving themselves only in farm fields (to fertilize them) to eating nothing but male peasants.

The Future Of Game AI

Because the hardware requirements for good AI systems are incredibly steep, don't expect to see any dramatic improvements in computer opponents in the next few years. There are some interesting things going on right now, such as Eric Bieschke's Rho-Bot for Half-Life (www.gamershomepage.com/rhobot),

Interview With
Soren Johnson

Soren is an AI Programmer at Firaxis Games, developer of Civilization III.

How is the AI implemented in Civilization III?

In Civ III, the computer employs a mixture of AI techniques, including fuzzy logic, probabilistic reasoning, finite-state machines, and decision trees. The AI controlling diplomacy, for example, requires a reasoning model almost entirely unlike the AI controlling unit movement. Thus, being flexible enough to consider using any conceivable AI technique for any specific task was extremely important.

What advances do you feel strategy and wargame AI will make in the next few years?

The new frontier for game AI is adaptive algorithms. In other words, the computer builds up experience from playing the human that helps the AI improves its own performance. Thus, a "three-month-old" AI would be better than a "fresh-out-of-the-box" AI.

Any parting shots regarding the field of gaming AI you'd like to leave us with?

There is only one magic bullet for making good game AI, and that is hard work. On its own, the AI knows nothing and can do nothing. No new, hot, flashy academic technique is going to change the fact that a computer fundamentally does not understand the concept of playing a game. Every bit of "artificial intelligence" is painstakingly built from scratch, and the results appear intelligent only if the individual components are made as flexible as possible.

Read our full interview with Soren at www.smartcomputing.com/cpumag/jan02/gameai.

This Yeti is part of Creature Labs' Beasts, a real-time strategy game that incorporates ALife technology.

which interactively chats with players, thanks to its incorporation of Alicebot technology (www.alicebot.org).

A.L.I.C.E. uses a large database of topics to chat realistically with humans and has won a variety of AI competitions, including the Loebner contest. The current implementation is far from perfect, spitting out a lot of grammatically twisted responses, but it beats the scripted and static responses that other bots exhibit. The dynamic speech systems currently being implemented and refined in projects such as A.L.I.C.E. have the potential to revolutionize game genres such as role-playing. Imagine a fantasy realm where nonplayer characters speak like real people instead of doling out canned responses to prewritten questions selected from a list.

Future game AI systems will be able to do far more than just chat realistically with players. Opponents in action games will gain the ability to share information and work cooperatively, using advanced tactics against players instead of relying on cheating, numerical superiority, and blind rushes. We're already seeing the beginning of things such as overwatch tactics, flanking maneuvers, and a proactive use of cover in games such as Bohemia Interactive's Operation Flashpoint: Cold War Crisis (www.flashpoint1985.com).

Strategy games and war games should see marked improvements in pathfinding, letting units find not only the most direct path to their destination, but also the soundest path both tactically and strategically. They will be able to take things such as line-of-sight, known pockets of opposition, and weather into consideration much better than they can today. The ultimate goal is to create AI systems that learn, adapt, and surprise players across all game genres without resorting to cheating, which is the poor man's AI technique used in nearly every game ever developed. **CPU**

by Tracy Baker

We have lots more game AI for you at www.smartcomputing.com/cpumag /jan02/gameai.

Introducing the new Palm™ m500 handheld. Inside its sleek little chassis, we've added an expansion slot so you can turn it into the ultimate photo album or eBook. The optional SD cards also let you back up or increase memory, or even access worldwide travel guides. As for included applications, you can download email, import and update Excel spreadsheets, even customize and manage web content with the MyPalm™ portal. We also included mobile connectivity software—add a modem or compatible mobile phone and your information can be accessed wirelessly. It's time to mobilize.

palm

Simply Palm™
palm.com

64MB SD Card

the last thing you bought
this expandable
had an elastic waist.

palm powered

The Neural Network

TEACHING COMPUTERS TO THINK

AI is the vision of the computing future and the stuff of which science fiction is made. Making it possible for a computer to "think" can be a boon for mankind, but what will it take to get to that point?

Traditional computers operate in a sequential mode, executing one instruction after another. This is great if you are adding numbers but inefficient if you need to process lots of information all at once. Personal computers do not perform "fuzzy logic" (making assumptions based on the information at hand) very well. They are too literal and can't make educated guesses based on multiple factors.

For a machine to possess artificial intelligence, the system has to able to handle millions of computations per second and process millions of input data in real-time. A neural network tries to achieve this goal by mimicking the function and structure of the human brain and nervous system.

The key idea behind neural networks is that they can take in a lot of data, process it in parallel, and provide accurate output, much as the human brain does. For example, when you see a cow, you know right away that it is a cow. You don't have to stop and count legs or look at shape and color. You process all of that data at the same time to know that you see a cow. That's what a neural network does for a computer system.

From Neuron To Neuron

A real neural network, like the one that runs your body, is far too complex to look at in its entirety, so we're going to greatly simplify the neural system for the purposes of this article. Let's say the neural network is made up of neurons that are interconnected in a complex, 3-D fashion. Each neuron connects to other neurons with what are called edges, and each edge has a weight associated with it. The weights of each edge are vitally important to the system because they determine both the signal threshold level of the edge and the direction that an impulse can go from one neuron to another. Edges are not limited in number to each neuron. There can be many edges connecting to each neuron.

How does this work? Let's use two neurons as an example. (See Figure 1.) Suppose you have two neurons A and B connected via a single edge. If A is stimulated sufficiently to overcome the weight (resistance) of the edge, B becomes stimulated. If the impulse is too weak to overcome the weight, B remains at the same state. If the weight of the edge is negative (that is, it only allows a stimulus from B to A), no amount of stimulation from A will affect B, but B can stimulate A within the same rules.

Here's an example with three neurons. (See Figure 2.) If neurons A and B both have an edge with neuron C, you have the situation where a single impulse from either A or B may not stimulate C because the weight of the edge connecting C to A and B is greater than the impulse from a single neuron. But when A and B both send an impulse, C may become stimulated, as long as the combined impulse from A and B overcomes the weight of C's edge.

The Neural Network Structure

A neural network has a unique structure unlike conventional input/output systems. The neural network is made up of three layers: the input layer, the output layer, and a middle "hidden" layer. The hidden layer, and there can be more than one, is the heart of the neural network. This layer learns to recode or provide a representation for all of the inputs using fewer nodes than the original input. This means that 50 hidden layer nodes can learn to represent the input data from, say, 10,000 input nodes. The weights and edge connections in the hidden layer provide a highly complex yet flexible system for representing a large number of input signals as a smaller number of signals.

There are two main types of neural networks: the Back-Propagated Delta Rule and the Radial Basis Function. Both types can learn arbitrary mappings of input data and both are feed-forward (loop-free), meaning all signals move in one direction. The main difference between these types of networks is that a

Basic Two-Neuron Stimulus (Figure 1)
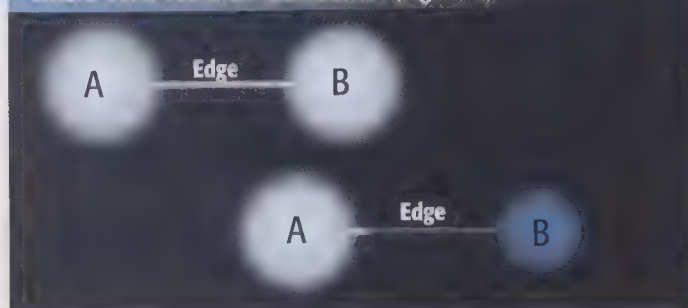
Three-Neuron Stimulus (Figure 2)
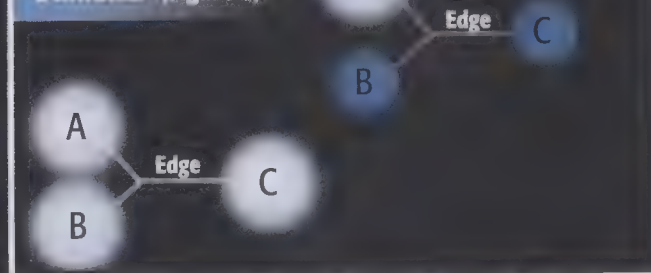
Back-Propagated Delta Rule network can have multiple hidden layers, while the Radial Basis Function network only has one. Researchers believe the Back-Propagated structure can learn any mapping given two hidden layers.

The Radial Basis Function structure, with its single hidden layer, has a center value that provides maximal output. The output trails off the farther the input signal moves away from this value. This type of neural network provides a tighter output signal than the Back-Propagated structure because of its value sensitivity to input stimulus.

Training a network. Before a neural network can do anything useful, someone has to train it. The network must learn how to recode input data so that the correct result is presented at the output layer. The weight change rule is a development of the neural network learning rule. The weights associated with each edge are changed by an amount proportional to the error at the node multiplied by the output of the node feeding into the weighted edge.

A learning run requires a forward pass, where both the outputs and the errors of the outputs are calculated, and a backward pass, where the output error is used to modify the weights on the nodes in the hidden layer. This continues until the output error is small enough or we give up trying to train the network. As the number of nodes in each layer increases, so does the number of unique combinations the network can learn. This also increases the time it takes to successfully train the network, but ultimately, the more the better.

A supervised network requires a teacher to tell the network what the desired output should be. An unsupervised network changes and adapts purely in response to its input and is well suited to picking out structure in its input. Although it does take an unsupervised network longer to learn than a supervised network, both the networks should run at about the same speed (which is extremely fast) once trained.

What's In It For You

There are a number of real-world applications already using neural networks to improve on processing efficiency. Banks are using neural nets to analyze signatures on documents and compare them with those stored on paper documents. Other neural nets are used in process control, specifically in the petroleum and chemical industries, and for monitoring aircraft engine vibrations and noise levels and comparing them with accepted tolerances. Look for other advances, such as Pen PCs, speech and vision recognition systems, and a new crop of "smart" toys, that use neural networking.

The most complex neural network doesn't even come close to the complexity of the human brain. But we will see advances in neural networks that will greatly improve the speed and efficiency of data processing and step up computing power to the next level. AI might not be around the corner, but it is getting closer with each learning pass. **CPU**

by Keith Schultz

Training A Radial Basis Function Network

Stage 1
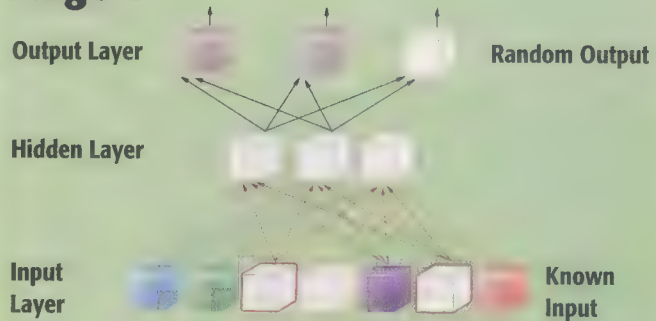
In the first pass through the network, the hidden layer is unknown. As the input data flows through, the network delivers a random output.

Stage 2
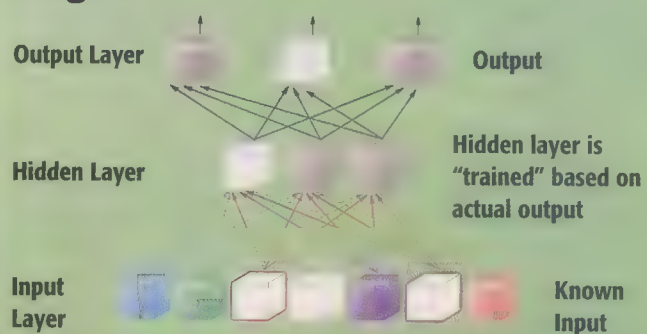
The next time through the network is the learning pass. The hidden layer is "trained" in this stage using forward and backward passes.

Stage 3

Now that the hidden layer is trained, the network delivers the correct output based on the specified network input.

Plan To Scan

In the past year, insidious, self-replicating worms, such as Nimda and Code Red, made mincemeat of thousands of corporate networks, worming their way through many non-networked home computers to do so. If you count on your suspicious nature (and careful treatment of EXE files) to protect you, or you use virus software that doesn't offer free updates, it's time to add more armor.

Before you bulk up your arsenal, take a peek at our roundup of top virus protection programs. We detail the improvements over earlier versions of the two biggies, Norton AntiVirus and McAfee VirusScan, and cover other choices that are reliable but don't quite measure up to the leaders. Once you review the options, you can decide which one (or ones) to add to your arsenal.
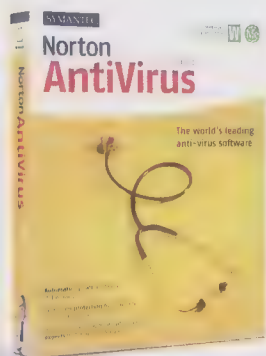
Norton AntiVirus 2002
$49.95; $29.95 upgrade
Symantec
www.symantec.com

Before you shell out hard-earned cash for any product, download a free demo if possible to see how it works on your system. I found several of the real warriors in this category, including Norton and Kaspersky, bogged down considerably, even on a 1GHz system. This was especially true when I enabled background virus scanning of e-mails, which made Outlook Express move with the agility of Frankenstein.

If you're diligent about not opening unknown attachments and reading e-mail from unknown senders, and you stay up to date on security patches and fixes posted for vulnerable products such as Outlook Express, you may be able to get by with one of the less-extensive virus scanners. These generally have less effect on system performance. If you want to assess the current state of your system before you do anything, check out Norton's free online virus scan at http://security2.norton.com.

Norton AntiVirus 2002

NAV (Norton AntiVirus) enjoys a reputation of being king among virus programs, based both on its performance and its high profile. (In any given month, chances are good NAV will be the market's best-selling virus product.) The reputation is well deserved because it's a powerful program with extensive features and tools. It has drawbacks, however. Particularly with later versions, NAV is a real resource hog (causing less-powerful systems to run like molasses). In addition, those with limited time or patience may find NAV's feature set to be overkill.

NAV scans a hard drive for viruses (including macro and polymorphic viruses), and it also scrutinizes both incoming and outgoing files and e-mail. It can also scan up to one level deep within compressed files. NAV eliminates the problems it finds, as long as you keep your definitions updated (which you can do automatically). Symantec claims to have a success rate of more than 95%, but external sources give it even higher ratings. In recent tests conducted during an independent virus test for the VB 100% Awards, NAV 2002 was the only product certified to detect and eliminate all in-the-wild viruses for every version of Windows currently available.

Upgrade considerations. If you have an older version of Norton and you're still eligible for updates, consider the list of major enhancements below to decide if you should update your software:
• New for NAV 2002: Script blocking, scanning and cleaning of outgoing files and e-mail, Windows Explorer integration, and automatic virus eradication

• New for NAV 2001: Automated online updates, more comprehensive e-mail scanning protection, and support for Windows Me and earlier
• New for NAV 2000: E-mail scanning, improved processing of compressed files, and support for Windows 2000 and earlier
• New for Version 5: Infected file quarantine capabilities for infected files; improved Internet protection and integration, including sending infected files to Symantec; protection against Active X, Java, and Trojan Horse-based infections; and support for Windows 98 and earlier
• New for Version 4.0: Bloodhound Technology, which seeks out unknown viruses based on established profiles (file logic, structure, etc.) of likely offenders, and support for Windows 95

The only downside to the newer versions, as of this writing, is that the browser
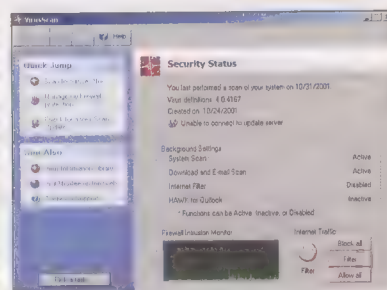
McAfee VirusScan 6.0 and VirusScan Online
$39.95 (6.0); $39.95 for two years (Online)
Symantec
www.symantec.com

plug-in (new with Version 5) will only work with Netscape.

McAfee VirusScan 6.0

If Norton is the king, VirusScan is the crown prince. Where viruses are concerned, it is a powerful force to be reckoned with, and its interface and features are slightly simpler and easier to use than Norton's. VirusScan

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

typically trades positions with Norton as top dog several times a year. Version 6.0 offers options that Norton doesn't. These include the incorporation of a personal firewall to keep crackers at bay and scanning of synchronization files from PDAs.

Like Norton, VirusScan provides scanning for and protection against malicious e-mail and attachments, Active X and Java scripts, downloads, compressed files, and resident files on the hard drive. It eradicates macro and polymorphic viruses and has a security module that prevents unauthorized tampering with the virus scanner, such as malicious disabling of profiles by an outside entity. An added benefit for networked environments is its ability to scan network-based (MAPI and cc:Mail) e-mail systems.

If you don't like the hassle of downloading and updating virus definitions, McAfee's subscription service provides ongoing access to the latest AVERT (Anti-Virus Emergency Response Team) solutions over the Web.

Upgrade considerations. McAfee's earliest versions (2.x and before) are feeble compared to its competitors. With Version 4.x, McAfee added an improved scanning engine—versions earlier than 4.x should be upgraded. The engine is so different, in fact, recent virus definitions won't even work with those earlier versions. Here are the new update features:

- New for Version 6.0: Support for Windows XP, PDA synchronization scanning, integrated firewall protection
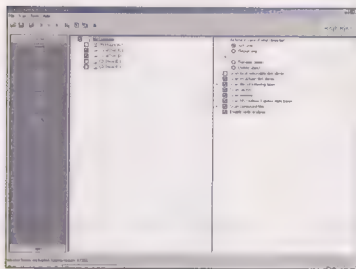
Kaspersky Anti-Virus Lite
$19.95
Kaspersky
www.kaspersky.com

- New for Version 5.0: New AVERT scanning engine and user interface
- New for Version 4.x: New scanning engine and Internet support, command-line mode (run outside of Windows in DOS), and network e-mail scan
- Prior to Version 4x: Because of its inferior scanning engine and incompatibility with current virus definitions, we didn't detail the enhancements in prior versions. Users of earlier VirusScan versions should upgrade or purchase another product.

Kaspersky Anti-Virus Lite

If you don't want to spring for Norton or McAfee, take a look at Kaspersky Anti-Virus Lite. At $19.95, it provides basic virus protec-

Quick Heal Virus Buster
$30
Cat Computer Services
www.quickheal.com

tion with unlimited, user-downloadable virus definitions (which the company updates daily). The full version (Personal) carries the same price tag as Norton, with a comparable feature set. In recent tests, Norton outperformed Kaspersky, but the past string of awards and certifications Kaspersky has garnered still make it a viable option.

Quick Heal Virus Buster

This shareware product hasn't achieved independent certification (which is why it didn't receive a higher CPU rating), but users give it high marks for its success rate. It's a broad-based program, covering viruses and
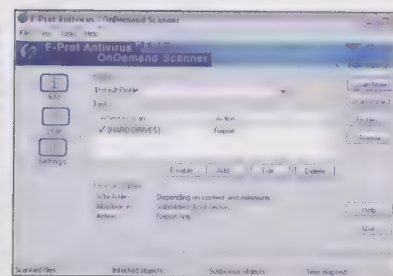
F-Prot
$25
Frisk Software International
www.frisk.is

macros, but also Trojan horses, worms, backdoors, logic bombs, and other nasty offenders. It scans removable media, the Internet, downloads, e-mail attachments, compressed files, networks and intranets, and even online services. Its strength in a network environment makes it an affordable option for in-home or small-business networks.

The program's interface is very direct, which is also a plus for those with limited time or ability. Like Norton and McAfee, it offers a live update feature to ensure the latest definitions reside on your computer. The main downside is that Cat Computer Services is based in India, which means no toll-free numbers for technical support.

F-Prot

F-Prot is a little-known product that runs on the same virus engine (Frisk developed it) many small antivirus firms use. It currently recognizes more than 50,000 viruses and has recently received VB100% certification for both WinMe and Win2000. It had previously received it for Win98. In addition, the company has recently released a version that is optimized for WinXP.

So why didn't it garner more CPUs? The company is based in Iceland, and it has no toll-free number, which to us means getting support could be a pain (and expensive). In addition, its feature set pales in comparison to NAV and VirusScan. Even so, its powerful

CPU Ranking: 0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect

scanner makes it a valuable addition to any virus arsenal—as a background scanner only. If you spend a lot of time on the Internet or download many files, consider buying F-Prot in addition to another product.

PC Door Guard

Like F-Prot, PC Door Guard is an unsung, international hero with a specific mission. It won't conflict with any other virus software you install, and it will act as your second line of defense, scanning against Trojans, backdoors, and other viruses. Trojan eradication is where it really shines. Several virus experts have given it kudos; its scanning engine is especially good at finding even
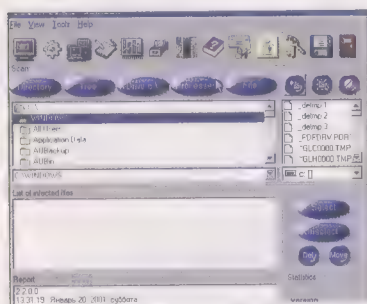
PC Door Guard
$25
AstonSoft
www.astonsoft.com

unknown types. AstonSoft is based in Estonia, which could mean problems for support, but users have reported that the support personnel are very helpful.

Final Thoughts

It's likely you have virus protection software installed, but if you're still running NAV 4.0 that came with your computer and you haven't bothered to download updates, your system will be infected. Viruses are becoming more intrusive every day; anyone who doesn't protect their files against them will regret it, sooner or later. **CPU**

by Jennifer Farwell

The Future Of Viruses & Why You Should Care

Computer viruses have been causing headaches for PC users since 1986, when a couple of programmers realized they could replace the boot files on floppy diskettes with their own code. The code didn't do anything more than execute at startup and replicate itself. For several years, virus hype was more rampant than the actual viruses, causing some PC experts to deny the existence of viruses at all.

Much has changed in the virus world since then, and viruses are a major threat, especially to corporations and large networks. There are now more than 60,000 PC viruses in circulation, with dozens more released each month. They range from boot-sector viruses to macro viruses and e-mail worms.

Until recently, however, a rule of thumb has existed that protected wary PC users: Your PC can't be infected unless you open an infected file. Sadly, this is no longer true, as wily virus architects have found ways to create files that disguise themselves as other items, copy themselves to your PC, and wreak havoc without your knowledge.

The catalyst for this worrisome development was the Internet, the world's largest network, and more specifically, the World Wide Web. Because much of the code that drives the Web is executable, users who let their computers accept this code are making themselves susceptible to the latest generation of viruses. Internet surfers who visit infected Web sites can fall prey to a virus, as well.

Perhaps the best example of this new type of menace is the Nimda worm, which slammed networks and home users alike exactly one week after the Sept. 11 attacks on the United States. Nimda infected Windows systems from Win95 through WinMe (including WinNT and Win2000). The mass-mailing e-mail worm also spread through a user's browser (via an infected Web site as mentioned earlier). Nimda has a number of particularly gruesome characteristics, including:

- It's possible to activate the virus by viewing an infected e-mail within the Microsoft Outlook Preview Pane only. The user doesn't have to open an attachment, or even view the e-mail normally.
- The e-mail attachment name changes as the virus spreads.
- The e-mail created by the worm contains an attachment that can be disguised as something else

and that can self-execute without the user's involvement or knowledge.

- It can infect HTML sites without the host company's knowledge or participation and then spread itself to others who visit the site.
- It scans for shared folders and copies itself to all appropriate locations, which can include a user's startup folder. It then opens those folders to exposure by others.
- It is coded to search for and find entrance through unresolved vulnerabilities left by earlier worms and viruses.
- In systems where it becomes resident, it scans the Internet for additional targets whenever a network connection is active. This excessive scanning slows, or even shuts down, networks.

Nimda doesn't erase hard drives or overwrite boot sectors but focuses rather on spreading itself as much as possible. This makes it more malicious than destructive, but its means of propagation will most assuredly be the model for much more harmful attacks in the future. Consequently, up-to-date virus protection is becoming a must-have for pretty much everyone who has contact with the outside world via his or her computer. ▲

CPU Ranking: ⟋ 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Jerry Hatchett

Download Accelerator Plus 5.0

Download Accelerator Plus (DAP) works around the download throttles present on many bandwidth-conscious sites by splitting a file into several small components for simultaneous download through multiple connections. DAP reassembles the components on your machine and also looks for the same file on alternate sites, pulling files from the fastest ones.

Installing DAP was painless. The app integrated nicely into Internet Explorer versions 5 and 6 and ran reliably on Windows 98/2000/XP. The clean interface is good, especially when configuring DAP's many options. Proxy downloads are also a snap to set up.

For many files, I failed to notice a speed improvement over using a straight browser or FTP download on a properly tweaked machine.

The difference was dramatic with other downloads, sometimes doubling or tripling the speed of a straight download. DAP relies on the speed of source sites, if the file is available to download from several sites at once, and if source sites allow or refuse multiple connections.

Nothing is as frustrating as having 39MB of a 40MB file downloaded when your connection coughs. Conveniently, DAP saves the day by letting you resume an interrupted download if source servers permit DAP's Resume feature to work. You can also add a DAP toolbar to your browser to access key features.

I tested the free 5.0 beta version of DAP. A $29.95 registration fee gets rid of the banner ads and promises better performance. ▲
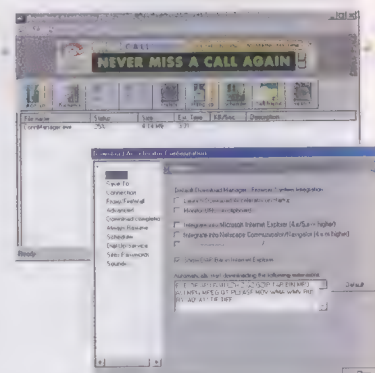
Download Accelerator Plus
Free; $29.95 registration
SpeedBit
www.downloadaccelerator.com

FlashGet 0.96

FlashGet negates download speed limits by splitting files into smaller pieces for simultaneous download. It puts the pieces back together on your system and searches for the file on other sites, automatically downloading the fastest ones.

FlashGet runs smoothly on the entire Win9x/Me family but choked consistently on WinXP. For some files, there was no appreciable increase in download speed vs. a straight download via a broadband connection. Results with other files produced big smiles as FlashGet found faster servers and completed downloads in half or a third of the normal time. FlashGet's ability to resume broken downloads (on some servers) is also nice.

By default, FlashGet displays a Drop Zone icon on the Desktop to drag links to and begin downloads. You can also select file virus scans using the program of your choice, plus specify different configurations for a variety of FTP and HTTP methods (you can download FTPs through a proxy and grab HTTPs via a direct connection). You can also designate sounds to signal download completions or errors. FlashGet's file manager runs downloaded files on completion and separates files into categories, such as software, music, games, and more.

I like FlashGet a lot, and an XP-compliant version will strengthen my fondness. I tested the free version. Ax the ads for $15. ▲

FlashGet
Free; $15 registration
AmazeSoft
www.amazesoft.com

Go!Zilla 4.0

Despite its popularity, I found Go!Zilla lacks reliability and user friendliness for power users.

While attempting to install Go!Zilla, it tried to not only install Gator/Offer Companion, but an annoying Clickguide toolbar, as well. The program's skin-based GUI is nice, but I'd like to see functionality come first.

Go!Zilla crashing on our Windows XP system isn't unusual for now (other download managers do, as well). Go!Zilla not running properly on Windows 98 is unacceptable. I ran Go!Zilla on

four machines: two with XP installed and two with Win98SE. The program was a total no go on XP. And although it installed fine and ran on Win98, it gave us trouble on both machines. Without rhyme or reason, Go!Zilla simply failed to initiate a download after we instructed it to do so on many occasions. After uninstalling the program, the Download With Go!Zilla option was still sloppily in our right-click browser menus.

Hopefully, the folks at Radiate will iron out the bugs. You can get the version we tested free or spend $29.95 to $49.95 for premium versions. ▲

Go!Zilla
Free; $29.95 to $49.95 for added features
Radiate
www.gozilla.com

CPU Ranking: ⟋ 0 = Absolutely Worthless   2.5 = Absolutely Average   5 = Absolutely Perfect

by Jerry Hatchett

WinAce 2.04
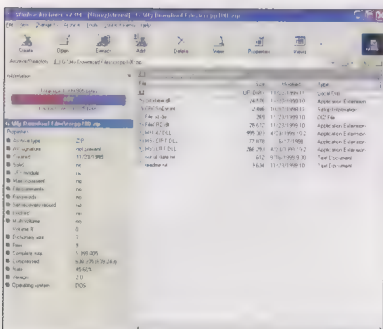
WinAce 2.04 is a full-featured compression utility. On the decompression side, it expands ACE, ZIP, LHA, MS-CAB, RAR, ARC, ARJ, GZIP, TAR, and ZOO files. Not surprisingly, ACE is the program's format of choice for compressing files, but you can also squeeze your content into ACE, ZIP, LHA, or MS-CAB files.

WinAce's interface will make any Windows user feel at home, and a sidebar on the left serves up a host of information about selected archive files, complete with a graph detailing the uncompressed, compressed, and compression ratio sizes of files involved. Below the graph is a list of other properties for the current archive.

What's not so impressive about WinAce is its speed, or lack thereof, when working in its namesake archive format. I tested the program on a custom-built clone with a 1GHz Pentium 4 and 640MB of RDRAM running Windows XP Pro.

It took WinAce 43 minutes to compress a 900MB directory in the ACE format. When we switched to ZIP format, WinAce performed the squeeze in just more than seven minutes. I can understand a certain amount of speed loss if I were picking up extra compression in the process, but there was no significant compression gain in using ACE vs. ZIP. According to WinAce, ACE uses a more efficient and faster compression algorithm than ZIP; however, our results were just the opposite.

Bottom line? I like WinAce's interface and layout, but I really don't see a need to add another compression format to the mix, especially when there's no obvious benefit in doing so. WinAce is available in several configurations, with prices ranging from $29 to $59. The $59 package includes a handy module called SfxFactory that lets you easily create self-extracting files and simple setup routines. A free 30-day trial version of WinAce is also available. ▲

WinAce
$29 to $59
WinAce
www.winace.com
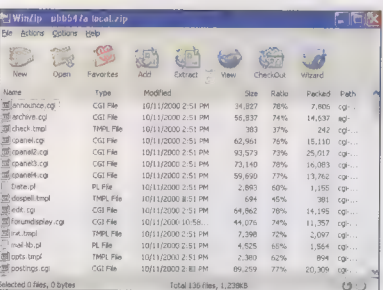
WinZip 8.0

WinZip 8.0 continues to be a workhorse compression utility, able to handle almost any archive format you're likely to encounter while moving through archives in both directions with speed and ease.

Context menu integration in Windows Explorer is a nice WinZip feature that will let you quickly compress or decompress files without separately launching the WinZip application. Right-click a file and the context menu will let you quickly compress it using the Zip option. Or choose the Zip And E-mail option and the file will automatically compress with an e-mail window opening up with the file in place as an attachment.

I also took a look at the current 8.1 beta version of WinZip. It also offers new options in the right-click menus, such as printing contents of a ZIP file. In addition, if you need to put a 5MB ZIP file on a floppy, it's no problem. Open the file in WinZip, choose Split from the Actions menu, and choose 1.44 MB from the

drop-down menu. Name the file and WinZip will automatically create a set of four files that will all fit on the floppy. Stitching the files back together is an equally painless endeavor on the destination machine.

WinZip is the de facto standard in the world of compression, and it's easy to understand why. The program is rock solid, speedy, and easy to use. It offers a "classic" or "wizard" interface. Power users will prefer the classic interface rather than being baby-stepped through simple choices.

WinZip continues to lead the compression pack, and I heartily recommend it. You can download an evaluation version at www.winzip.com. It's $29 to buy. The registered version includes WinZip Self-Extractor Personal Edition, which lets you create self-extracting EXE files for distribution to the technically challenged. The 8.1 upgrade of the utility will be free for 8.0 registered users. ▲

WinZip
$29
WinZip Computing
www.winzip.com

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

The Bleeding Edge Of Software

by Warren Ernst

GRAPHICS & DESIGN BY GINGER RILEY,
JASON CODR & DAVID FIALA

Inside The World Of Betas

Fortune telling becomes an exact science when it comes to working with betas. This month we bring you four glimpses into the future of software.

ICQ 2001b Beta v5.15 Build #3638

It seems unfair to call attention to the beta status of any ICQ versions because they are always beta versions. The early November release of 2001b Beta 5.15 #3638 (whew!), however, adds worthwhile features longtime users have been clamoring for and new users will appreciate.

The two biggest additions are a Shared Folders feature and new firewall detection routines. Shared Folders are essentially another peer-to-peer file sharing system akin to Napster or Aimster. Like Aimster, Shared Folders only works with users on your ICQ contact list, and you can only get files from those who have you on their list. The firewall detection schemes rate only a few lines in the README, but this is a huge improvement.

Before, if you had a personal hardware firewall on a home LAN, you had to monkey around with port-forwarding tables to make ICQ file transfers work. And if you tried to ICQ buddies at work behind a corporate firewall, you were usually out of luck. Now, ICQ just works.

Other small improvements abound. The message dialog box has a spell checker, an enhanced smiley pull-down, multilingual support, and the choice to send messages via e-mail, ICQ messages, or SMS. Buddy Lists are now stored on the central server, so when you change machines, your contacts stay with you. ICQ can also append HTML signatures to your outgoing mail, indicating whether you are online or offline.

This latest ICQ version is free to download and so stable you should replace your version, pronto.

Official product name: ICQ 2001b
Version # previewed: Beta v5.15 Build #3638
Publisher: ICQ
Developer and URL: ICQ; www.icq.com
Product URL: www.icq.com
ETA: Now
Why should you care: Because ICQ gets better with every beta release, and this one is no exception.

ClarkConnect 0.8.1

ClarkConnect is difficult to pigeonhole: Is it a software package or a Linux distribution? Is it a firewall, connection-sharing package, or print/file/FTP/Internet/Web server for LAN host? Does it stand alone, or do you need Windows? The best answer is, well: Yes.

ClarkConnect is a Linux distro, but it's specially tuned for a few specific tasks, and it responds to a few Windows modules, exclusively. Here's how it works: Suppose you have an old PC with two network cards. ClarkConnect turns it into a machine that acts as a firewall to your LAN, shares an Internet connection to your LAN, acts as a shared Windows drive to PCs on the LAN, acts as a shared AppleShare drive to any Macintosh on the LAN, acts as a shared Windows printer, and looks like an FTP and Web server to the rest of the Internet. Cost? Free to $40, based on the features you need.

ClarkConnect is intimately tied to Windows and geared for beginners who haven't touched Linux. The installation routine is the easiest I've seen for Linux. Once installed, you never need to touch that computer's keyboard again. All configuring and monitoring is done through a Web page interface or a small suite of Windows applications on a Windows PC on your LAN.

ClarkConnect runs on top of RedHat Linux v7.1. It's simple to configure and maintain, and it's robust. I recently used it to spread a T1 line to 85 PCs to set up a LAN in a hotel ballroom for a weekend. Hiccups: 0. Happy users: 85.

Official product name: ClarkConnect
Version # previewed: 0.8.1
Publisher: Point Clark Networks
Developer and URL: Point Clark Networks; www.pointclark.net
Product URL: www.clarkconnect.org
ETA: Q1 2002
Why should you care: Because you can put that old hardware to work.

Winamp 3 beta 1 love

Perhaps more than any other app, Winamp has brought MP3s into the mainstream, and perhaps because its the granddaddy of MP3 players, the current Winamp incarnation is a little stale. There are plenty of plug-ins, modules, and skins available, but all of the plug-ins are self-contained (they almost never "talk" to each other), and the skins don't alter the GUI's fundamental structure. And the feature set has never been described as being expansive.

Winamp 3 promises to change all that. Yes, the beta 1 love version for the PC isn't exactly what I'd call stable, but as the README states, it isn't supposed to be. Instead, Winamp 3 is more of a working model for skin, script, and plug-in writers. Given all the new functionality Winamp 3 supports, this working model is exactly what the doctor ordered to jump-start new development.

Finally, Winamp skins do more than just change the appearance but not the position of the player's controls (the instantly recognizable Winamp Rectangle may be a thing of the past). For example, some of the sample skins include sensuous, teardrop-shaped orbs; clones of competing players long dead; and duplications of the HAL 9000 control panel. Very slick.

Featurewise, Winamp3 catches the competition in many respects. Multiple playlists are much easier to manage, and you can sort songs by the ID3 tag built into most MP3 files. Looking for a random playback of nothing but Billy Joel and Comedy from your 10,000-plus playlist? No sweat. Connecting to ShoutCast Internet radio servers is also streamlined, with built-in server browsing.

If you're a skinner or a ShoutCast junkie, the beta is worth using now. For most folks, though, waiting for the next beta might be a good idea.

> **Official product name:** Winamp 3
> **Version # previewed:** v3 beta 1 love
> **Publisher:** Nullsoft
> **Developer and URL:** Nullsoft; www.winamp.com
> **Product URL:** www.winamp.com
> **ETA:** Q1 2002
> **Why should you care:** Because Winamp hasn't had a facelift or features upgrade for a few years. This beta changes everything.

ActivatorDesk Internet Desktop 5.0 3b

Most folks can count the Web browsers available to them on two fingers. Even experts would be hard-pressed to come up with a handful. No matter the number, browsers work on the basic premise that users should be able to view what they want on the Internet. ActivatorDesk is different. AD purports to be a browser and replacement Windows Desktop that limits what you see and do on the Internet and your PC. It is indeed limiting, but I suppose that's the whole point.

For starters, AD is a multiuser Web browser and Desktop. An administrator can set the browser/Desktop combination to run and view anything, or run only specified programs and Web sites available via the InfoGrid Web portal when your teenager uses it, or only a select program or two and a few sites when your young child uses it. As a "secure Desktop," AD can even disable the Start menu and other Windows features. For example, if you set AD as your Desktop Shell, you could set up a fairly secure unattended kiosk.

The Web browser portion has some neat tricks. By default, AD effectively kills banner ads and browser window pop-ups. Cookies are automatically disallowed, and the browser works in sort of a "protective box," which supposedly keeps belligerent ActiveX and Java applets from getting out and doing damage.

The beta is reasonably stable, but even on a fairly quick system (922MHz PIII), the entire system seemed a little less sprightly than before. The beta also builds on Internet Explorer 5.0 or greater, so update your existing browser before firing up AD.
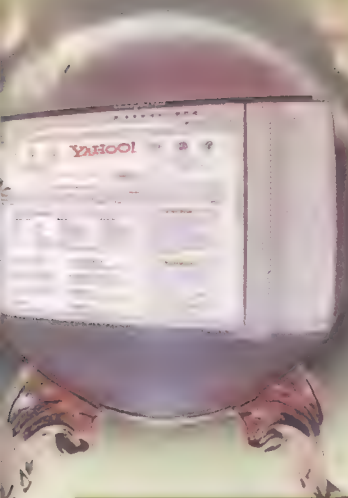
> **Official product name:** Activator Desktop
> **Version # previewed:** 5.0 3b
> **Publisher:** Roger Lee Heath
> **Developer and URL:** Roger Lee Heath; www.activatordesk.com
> **Product URL:** www.activatordesk.com
> **ETA:** Q1 2002
> **Why should you care:** Because a genuinely different browser and Internet security scheme doesn't come along every day.

Infinite L∞p

Beer vs. the Internet, Part II

In 1998, media outlets around the country announced the beginning of a new era. The Student Monitor's biannual survey of college students found that the Internet was more "in" than drinking beer.

Perhaps the antibeer crowd celebrated too soon. The Fall 2000 Student Monitor reported college students once again consider the Internet less "in" than drinking beer, drinking other alcohol, and going to clubs. Technology fans may still have reason to celebrate, though. The only thing considered more "in" than drinking beer? Cell phones. (SOURCE: THE STUDENT MONITOR, LLC)

1998

2000

Accesses Internet radio, MP3s and stored CDs so easily, you won't need help from your kids.

Introducing the Wave/PC™ system. A revolutionary new product from Bose®.

You don't have to be young to make the most of your PC's musical capabilities. Because now there's the Wave/PC™ system. It doesn't matter if you're 7 or 70, the Wave/PC™ makes it easy for you to go from Web radio to MP3s to stored CDs at the touch of a button.
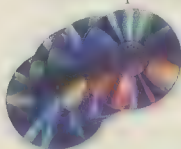
Access thousands of Net-streamed radio stations.

You can listen to Web radio stations from around the world with the Wave/PC™ system. Its search feature lets you find the music you want quickly and easily. You can also download MP3 files through the Web and store them on your hard drive for later playback.

Store and organize your CDs on your PC.

Record your CDs on your hard drive, so all your music is easy to access. Never suffer through those songs on a CD you don't want to listen to again. The Wave/PC™ system lets you select your favorite songs and then file them on your PC. You can even make compilations of your favorite songs from different CDs.

System Includes:
Software
Audio Unit
Remote Control

It's as easy as using the remote.

The Wave/PC™ comes with a remote that lets you go from Internet radio to MP3s to your stored CDs without ever interrupting what you're doing on your PC. Access preset Internet radio stations, music files and conventional AM/FM radio. With just a simple click of the remote, you can enjoy all the music you want on your PC.

All this, plus Bose quality sound.

To truly enjoy the variety of music you'll have access to, you need to hear it through a great-sounding music system. That's why the Wave/PC™ combines the power of your computer with the high-fidelity sound of acclaimed acoustic waveguide technology. So whether you're listening to Internet radio, MP3s or your stored CDs, you'll hear all your music in rich, room-filling sound.

Priced at $449, the Wave/PC™ system gives you endless music variety through your PC, along with the great sound you'd expect from Bose, all at the click of a remote. It's so easy to use, you don't have to be a kid to get it.

BOSE®
Better sound through research®

---

*Installment payment plan not to be combined with any other offer or applied to previous purchases, and available on credit card orders only. First payment to include shipping, handling and applicable sales tax. Price and/or payment plan subject to change without notice. ©2001 Bose Corporation. Patent rights issued and/or pending. The Wave® radio design is also a registered trademark of Bose Corporation.

by Chris Pirillo

Maximizing Your Windows

When you can't complete tasks on your own, turn to third-party software. No doubt you've taken a trip to AnalogX.com once or twice before; Mark Thompson's penchant for developing killer freeware is no secret. Sysinternals.com also has a set of sweet downloads. Bearing in mind that the entire galaxy hasn't upgraded to an NT-based kernel, here are some must-have, lesser-known Windows utilities for novices and professionals.

It's never been easy to change registered file extensions—if they are hidden. Sure, you could drop to a command prompt and do it from there, using CMD.EXE in WinNT/2000/XP and COMMAND .COM in all other Windows versions. 4NT or 4DOS from JPsoft.com will work as nicely. But what about doing it from the GUI? ChangeEXT from Justask-computer.com is a time saver; with it, you can right-click any file, short-cut, or series of objects and view properties via the context menu. Should that JPG really be a TXT? ChangeEXT it instantly with this free add-on. Which brings me to instant messaging.

Everyone's trying to create the ultimate IM app. ICQ got a jump on the competition years before the world even knew what an e-mail address was. AOL and Yahoo! developed something for their users over time, too. And Microsoft? It attempted to woo users to their client, but people have been reluctant. Windows (MSN) Messenger not only lacks essential features, it doesn't get along with other IM programs. To add features, I rely on the Messenger Plus! Extension from Patchou.com. It enables conversation logging, macros, window transparency, and more. Microsoft should hire this guy. He does a better job with the product than it does!

IM interoperability isn't just a Microsoft problem. Until there's a standard for this new form of digital communication, I'll use Trillian from Trillian.cc. It's free, skinnable, and allows me to connect to MSN, Yahoo!, AIM, ICQ, and IRC simultaneously. This sucker is cleaner, faster, better, and (most importantly) unified. It isn't perfect but has about everything I want in an IM program.

Now, how many Internet shortcuts (URLs) do you have at any given time on your Desktop, in your Favorites, in various folders on your C drive?

> **Bearing in mind that the entire galaxy hasn't upgraded to an NT-based kernel, here are some must-have, lesser-known Windows utilities . . .**

Double-click one and you're whisked to the designated Web site. But what if you care to copy that URL to the clipboard? What if you want to format it as an HTML link? It's not so easy to do on your own. Normally, you have to select the icon and tap ALT-ENTER to pull up its properties. Then you have to copy the URL to the clipboard. Ugh. It's much easier with CopyURL from Moonsoftware.com. This free shell extension allows you to right-click an Internet shortcut (or series of shortcuts) and copy it to your clipboard in one of three ways. Neat.

Looking for a Notepad clone? The best one is Metapad from Liquidninja.com. It looks and feels like Microsoft's super-simple text file viewer, but with 10x the functionality. It has global search and replace, Favorites, and the ESC key can close the window swiftly. It's free; download and replace Notepad.exe with it ASAP. Win2000 and WinXP users need to replace the default Notepad editor in three locations; it's also in the System32 and subsequent Dllcache subdirectories.

Don't forget about images on your hard drives. Sure, WinXP makes them easier to view and manage, but if you want a more functional tool, pick up ShellPicture from BaxBex.com; it's shareware and worth every penny. You can preview images within the context menu, see their dimensions, and convert formats on the fly. It's as indispensable as IrfanView, which you can get from Irfanview.com. This freeware image viewer/editor has been around forever.

What about the user shell? It may be eye candy but it can make your GUI even sweeter. You can change colors in even more window components that you can't change via the Display Properties. Yeah, grab 3D Color Changer 3000 from Jotenet.cjb.net and you'll be in business. For those with WinXP, you should know that XP has built-in support for ClearType, a cleaner kind of font anti-aliasing. To maximize its potential for your screen, visit Microsoft.com/truetype for an online tweaking tool. It's worth checking out. ∎

You can dialogue with Chris at chris@cpumag.com.

Chris Pirillo is the founder of Lockergnome.com (www.lockergnome.com), which distributes free technology-related newsletters daily. Chris also hosts "Call for Help" on TechTV (www.techtv.com) and answers tech questions on his syndicated weekly radio show.

by Pete Loshin

It's ALIVE!

Pete Loshin, former
technical editor of
software reviews for
BYTE Magazine (print
version), consults and
writes about
computing and the
Internet. He also runs
www.linuxcookbook.com.
He owns shares of both
Microsoft and Red Hat
and believes that
Windows isn't for
everyone, but neither
is Linux.

The cards were stacked against this month's project: reviving my oldest computer, an awesome little 1993-vintage Compaq Concerto. It runs DOS 6.22 and Windows 3.1 just fine, but its 25MHz 486 CPU, 4MB RAM, 1.44MB floppy, 80MB hard disk, and no CD-ROM drive just aren't up to modern versions of Windows or Linux.

Linux is doable on this system; it's just hard as hell to make it do anything useful. Why bother? Because the Concerto is stylish, compact, and usable; with its pen pointer and detachable keyboard, I've yet to find a more comfortable portable of any size. Sadly, Compaq dropped the line shortly after I bought mine in 1994.

Hoping to brag about using this relic, I planned to install minimal versions of Linux and the X Window System, get the Concerto talking to my network, and run my favorite programs from an application server instead of locally, making disk or RAM shortages irrelevant.

Easy, in theory. Install Linux, install X, and get the system to recognize a PCMCIA LAN card. Of course, the difference between theory and practice, in practice, is far greater than the difference between theory and practice, in theory.

4MB of RAM and 80MB of disk aren't enough for Linux and X. I couldn't do anything about the RAM, but I did scrounge a half-gig hard drive from a slightly better equipped (but more mundane) no-name notebook. Lack of RAM was tougher: 4MB isn't enough for modern Linux distributions to boot their install diskettes, but may be enough for a minimal kernel.

Fortunately, others see the value in having a functional, but otherwise "obsolete," portable computer running Linux: it's a minimal financial loss if banged around or lost. It can also be used as a terminal in a home network. Or just to avoid tossing a perfectly functional computer.

Little Linux projects help keep old PCs out of landfills. These distributions (see "Here Are Some For The Little Guys") permit older systems with few resources to be useful for various purposes: floppy-only systems acting as Internet routers or firewalls, recovery from hard drive failures, or file or print servers. I focused on distributions that turned obsolete systems into usable though spartan PC/terminals.

> **Little Linux projects help keep old PCs out of landfills.**

I found two mini-Linuxes that can boot in 4MB of RAM: muLinux and Small Linux. Slackware Linux (www.slackware.com) includes a version that installs and boots from DOS and fits on a Zip disk. Though currently on version 8.0, the 3.x releases reportedly boot in 4Mb of RAM, giving me hope Slackware might boot on my Concerto.

In short, Slackzip looked promising but seemed to choke on the RAM issue and muLinux sort of worked, but unreliably. Small Linux gave me a Linux prompt but no X and no connectivity. After weeks of effort, I've little to show for it, but this is more of a puzzle or hobby for me.

But I've more ideas, and I'll get it right, eventually. First, a cheap RAM upgrade should make it go, if I can find one. And a 2.5- to 3.5-inch hard drive adapter kit will let me install onto the drive in my desktop from CD, then move the drive back into the Concerto . . .

Or maybe I should just put the darn thing back on the shelf and find a different hobby.

Tidbit: Steam engineers monitored their machines by sound, smell, and touch. Network administrators may not be able to smell trouble, but Peep, "The Network Auralizer" (http://peep.sourceforge.net/index.html), lets you "listen" to your network. Normal networks sound quite soothing, while events such as bad DNS queries trigger shrill whistles; the overall volume increases as network load and number of users increase. More cool stuff under GPL. ∎

Here Are Some For The Little Guys

Linux On Laptops
www.linux-laptop.net

muLinux
http://sunsite.dk/mulinux

Small Linux Project
www.superant.com/smalllinux

tiny Linux
http://tiny.seul.org/en

Get saucy with Pete at opensauce@cpumag.com.

Is touch screen
technology a bell?
Or a whistle?

Or a drumroll
announcing one
heck of a
presentation is
on its way?

www.fujitsupc.com/b-series
1-877-372-3473

FUJITSU

THE POSSIBILITIES ARE INFINITE

Words From The Web
Yeah, they *actually* said this . . .

"Why do chat rooms seem [to] attract such trashy people?"
From a Yahoo! Computers chat room.

"it's cool to be strange!!!!!"
From an MSN Computers chat room.

"My computer won't 'shut down.' Can anyone help?"
Vague plea for help posted on a message board at iVillage.com.

"eww i put on lotion and it's old...ewwwww"
From an Excite 30s chat room.

"I work at a water park. It sucks. I work in the snack bar and have to get yelled at by retarded customers."
Posted on a Malgoo.com message board.

You Got Something To Say?

Web-junky blowhards seem to enjoy talking to no one in particular, which is evident if you've spent any time at all in a chat room. Now these chatterboxes can use the Email Roulette Web site (www.plinko .net/roulette/index.asp) to talk to a specific no one at random. The Email Roulette site works like this: You sign up to become a member and write an e-mail message. The message is randomly sent to another member and behold! You've made a new friend (or annoyed someone with your less-than-spectacular prose). According to Email Roulette's Web site, the game is the "finest form of e-mail entertainment to hit the 'Net since spam." And we all know what a hoot spam is.

Email Roulette does have some rules to follow to keep brutish online users in check. Obscenity is right out, and no racist remarks or hate speech are allowed, either. The rules also state that no spam is allowed. We assume they mean the traditional, commercial kind of spam and not the personal spam upon which this game relies, unless they mean canned Spam, which should be disallowed in any context. You have to send at least one message every six months or your membership will be revoked. You probably call your mom at least that often, so you should be able to meet this stringent requirement.

Infinite Loop

Made In China

Chinese piracy of entertainment software in 2000 was an astounding 99%, its highest level in five years. Industry sources estimated in January 2001 that there were at least 72 pirate factories operating in China, churning out nearly 550 million illegal copies each year.

(SOURCE: INTERNATIONAL INTELLECTUAL PROPERTY ALLIANCE 2001 SPECIAL 301 REPORT: PEOPLE'S REPUBLIC OF CHINA)

by Michael Sweet

It's Not Just The Shoes

You wouldn't expect a shoe store to be an outlet for your creativity or a fun place to waste an afternoon, but myadidas.com (www.myadidas.com) isn't a typical shoe store. This Web site is full of flash. It has a funky, head-spinning design and is loaded with Web candy. myadidas.com includes a couple of online games, and you can design your own levels for the games to share with your friends. You can also create your own music using preloaded audio clips and special effects or create a short movie using video clips of some poor sucker getting chased by a bull. If enough people visit your creations, you can win stuff from Adidas. Oh yeah, the site also features four cool shoe designs.

The only problem with myadidas.com is that it's hard on bandwidth, even if you have a broadband connection. It takes several seconds for the site (and many of the site's pages) to load. You'll also need to install the latest version of Macromedia Shockwave Player. But I think the long load times and downloading hassles are worth the effort;

I was impressed with myadidas.com. The Music Factory and Movie Factory, in which you create your own tunes and video clips, are very cool. The Movie Factory is the best feature by far. I whipped up a hilarious video of a bull chase scene in a matter of minutes, complete with cartoon sound effects. Oooh! Ahhh! Ohhh!

Multimedia Diva

Sugar-laced pop belly dancer Britney Spears is teaming up with omnimedia giant AOL/Time Warner to promote her new album and concert tour, according to an announcement made by AOL on Oct. 18, 2001. AOL will offer exclusive Britney-related videos and music to its 31 million members. The Internet powerhouse will also host AOL chats with

Spears, and AOL members will have first dibs on tickets to the bubble-gum princess's shows. As if that weren't enough, AOL plans to add a Britney channel to Radio@AOL. Maybe AOL can sponsor a Britney Spears mud wrestling festival or a "Find Britney's Belly Button" contest, too.

Each copy of Britney's new album (titled "Britney," cleverly enough) will include a free copy of the latest AOL software. Thanks. Now I have two reasons not to buy it. Is Britney's new single, "I'm A Slave 4 U" really about Steve Case? Apparently so. Sorry Justin, she's working for the Man now. The Spears/AOL deal means that MSN will be stuck with Christina Aguilera by default, and I wouldn't be at all surprised if MSN makes such an announcement soon.

Paper Beats Rock

Rock Paper Scissors is more than a game. It's the means by which people make many important decisions every day, usually by winning three out of five rounds. Who among us hasn't used Rock Paper Scissors to determine who's driving or who has to pick up lunch or who has to take out the trash?

This is a simple but addictive game, as I discovered when I visited the PlayRPS.com Web site (www.playrps.com). You can play

Rock Paper Scissors all day, every day (which is what I've been doing while I'm supposed to be working) against a virtual online opponent.

One of the things I think is cool about this site is that you choose a character to play, and the cast of characters is pretty funny. Each of the eight characters is based on a character from an action film, such as eTerminator, eMatrix, or eRaider (as in Tomb Raider's Lara Croft).

Once you choose your character, you enter a tournament. You have to defeat each character, one by one, to advance to the next round. You need to have the best score out of seven chances to advance. The online game, as in real life, is easy to play. Simply click the Rock, Paper, or Scissors icon and hope your opponent chooses poorly. So far, I've only made it as far as the sixth round, but someday I will defeat them all. ▲

If you find a strange, interesting, or funny Web site in the course of your Internet travels that you think is worthy of Fringe, send your suggestion to fringe@cpumag.com

by Lisa Lopuck

Debunking The Web-Safe Color Palette

A t the Web World conference in Seattle a few months ago, I was talking with a fellow speaker, Sandee Cohen, about the modern-day importance of the Web-safe color palette. While we both acknowledged that the palette is the "sacred cow" of the Web design world, neither of us could come up with too many good reasons to stick to it religiously. It seems that the Web-safe palette is like the Emperor's New Clothes; no one has yet dared to come forward with a case to make "burgers" out of the sacred palette until now.

In the Web's early days (around 1996), most people were logging onto the Internet through 640 x 480 monitors running 8-bit displays. Such 8-bit displays were capable of showing only 256 colors at one time. As you might imagine, 256 colors are not enough to render, with perfect clarity, that gorgeous 24-bit JPEG photo of the company's headquarters.

With only 256 colors, an image would become heavily dithered, or pixelated, and appear grainy. This same dithered effect would appear on non-photographic elements as well like buttons, text headlines, and simple graphics. These elements, at least, had a chance. By using so-called "Web-safe" colors (a palette of 216 colors that all browsers and platforms supported), designers could ensure that these elements stayed a single, solid color—not a dithered mess of numerous colors.

> **The Web-safe palette is like the Emperor's New Clothes; no one has yet dared to come forward with a case to make "burgers" out of the sacred palette.**

Old School

Back in 1996, the design strategy was to leave photos as 24-bit JPEGs and use Web-safe colors for all other graphic elements. The theory was that at the very least, people viewing through a souped up 16- or 24-bit monitor would see the nice image and graphic quality. People viewing through the 8-bit monitors would see dithered photos but clean graphics. Designers were discouraged from pre-dithering images because the browser would dither it anyway, and each browser on each platform had its own color palette and dithering scheme. Pre-dithering images would only make them look worse.

Following the old-school strategy, a Web page viewed through an 8-bit monitor would appear to contain a mix of perfectly flat-colored graphic elements and grainy photos. To the neophyte Web-viewing eye, the effect would look as if the designers intentionally dithered the photos for some purpose—perhaps download performance—or some other misinterpreted reason. (Think about all the amateur Web sites out there that still have 8-bit dithered photos "just like the pros.")

New School

While the old-school strategy worked well for 1996, the truth is that today, most people own the larger 17-inch, 800 x 600 displays capable of showing thousands, if not millions, of colors. Since 800 x 600 is the standard size that designers use for new Web sites, it only makes sense that we should also standardize on the full 24-bit color spectrum.

Doing so would open a floodgate of new color options. Just imagine banners and navigation bars filled with fresh, offbeat colors that Web surfers rarely get to see.

Another point to consider is that if a person using an 8-bit monitor visits a page using non Web-safe colors, everything on the page will appear dithered—not just the photos. In this case, the page becomes a visual clue that the monitor is to blame, not the designer (and that it may be time to upgrade!).

Of course, the ultimate consideration for a Web site's dimension and color palette is the target audience. But if most audiences have the larger monitors, chances are they also have the ability to see a lot more colors than exist in the 216 Web-safe palette. Now that I've stuck my neck out, I welcome your dialog. What do you think? Personally, I like my burgers with cheese; a new and brighter World Wide Web is within our reach!

Whether you agree wholeheartedly or think I'm nuts, let me know at lopuck@cpumag.com

Lisa Lopuck is an award-winning designer, an international speaker, and a best-selling author. She has been on Macromedia's Fireworks advisory board since the product's inception and has consulted for numerous Internet companies in the Bay Area. In 1998, Lisa founded eHandsOn.com, an e-learning content management company. In 1996, Lisa co-founded and served as Creative Director of Electravision, an award-winning Web design studio.

by Joan Wood

DIY PC Surfing

Before you start laying out cash and scuffing knuckles, get a handle on your DIY (do it yourself) system by using the Net to research **platform options**, **component selection**, and **pricing/availability**. Start by making a prioritized wish list of features and accumulate pertinent info (including URLs) by copying/pasting into a document as you go.

Platform options (CPU, chipset/motherboard, and memory) depend on which CPU manufacturer you select, so try getting into the AMD or Intel ballpark early. Enthusiast sites, including my old hangout Sharky Extreme, offer PC Buyer's Guides (www .sharkyextreme.com/theguide) with Intel/AMD DIY comparisons for a "paint-by-numbers" shopping list. But if you really want to blaze your own trail, read CPU reviews with multiplatform benchmarks to compare performance, price, and technical difficulties encountered. Some great resources are www.hardocp .com, www.anandtech.com, www .aceshardware.com, www.tech-report.com, and www.realworld tech.com, and a searchable article database like the one at Smart-Computing.com can save a lot of time. (Choose PC Components from the Pick A Category pull-down menu.) Also try Weekly Platform Trends on HardwareCentral.com to get some grounding. Both DIY/enthusiast and corporate/IT information sources are useful, as enthusiast sites will show you the moon while IT guys keep you attached to the ground (or at least to a wrist strap).

Component selection research comes next and may require backtracking and patience to find compatible products with the exact features you desire. Once you decide between Intel and AMD, start with the official word on component compatibility by going straight to the source. **AMD**, traditionally a DIY-friendly company, has a comprehensive Technical Resources section (www2.amd.com/us-en /Processors/TechnicalResources/0,,30_182,00 .html) that includes configuration info for both Athlon and Duron processor-based systems, including pull-down menu search listings of their recommendations for compatible thermal solutions and heat sinks (especially important for AMD-based systems), motherboards, and power supplies. DDR memory is also addressed, but AMD emphasizes checking with your motherboard manufacturer for final compatibility. There is also a handy System Build Checklist (www2.amd.com/us-en/assets/con

tent_type/white_papers_and_tech_docs/24387.pdf) available in the Build & Installation Guides section.

If, on the other hand, you decide on an **Intel** CPU and know that you want an Intel chipset-based motherboard, the Intel Motherboard Selector Guide (http://appsr.intel.com/scripts-boards) and Intel Chipset Comparison Chart (http://developer .intel.com/design/chipsets/linecard.htm) are both useful. Links to Intel's own products are convenient, but basic specs and main page URLs for other's boards are also listed. Multiple browser windows can keep product name/number handy when searching through the other sites. To access non-Intel chipset-based motherboard info, try Motherboards.org's MOBOT engine (http://iceberg.pchomeworld.com /cgi-win/mobotGen/mobot.asp) or go to chipset makers' sites (www.sis.com, www .viatech.com, or www.ali.com .tw) for listings of products using their respective chipsets.

> **Enthusiast sites often write about hardware long before it is widely available.**

Once you narrow down the component list for your dream system, research both on manufacturer's sites for product specs and compatibility and review sites for product news and reviews, noting installation problems and tips along the way. If you plan to play with Pentium 4 and DDR memory, try VIA's new Platform Solutions Division (www.viavpsd.com) or research Ali's Aladdin-P4 or the SiS645. Check *actual* availability of all necessary components when going with bleeding-edge technology, as enthusiast sites often write about hardware long before it is widely available. Reviews of retail products, not technology previews, should direct your final decisions.
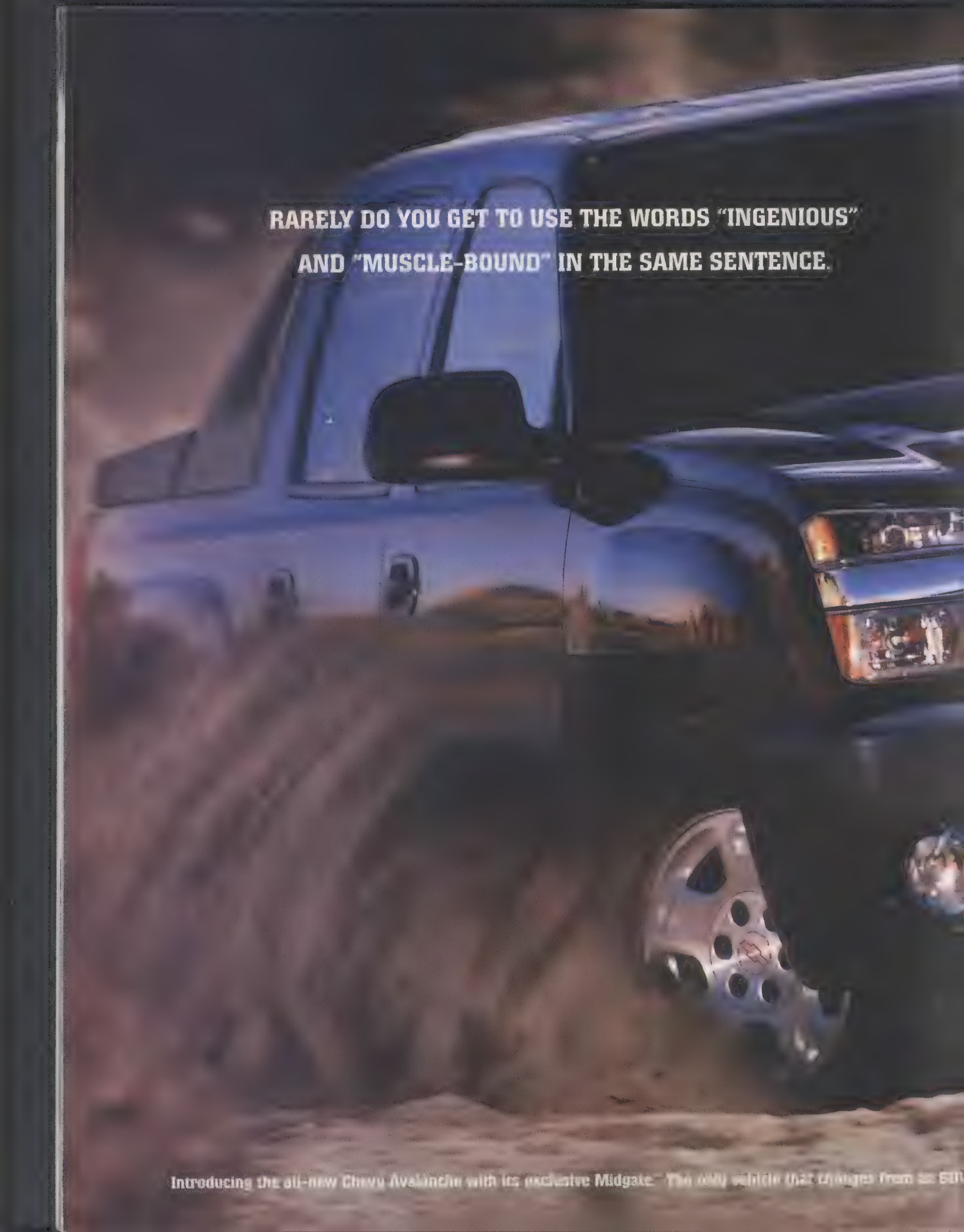
Pricing/availability research can start with the Weekly Price listings for CPUs, memory, motherboards, and video cards on sites like AnandTech and Sharky Extreme and progress to product searches on sites like PriceWatch.com. The price comparison listings that include brand, description, shipping, and availability info are generally supplied by individual dealers, so be cautious and don't forget to factor in shipping costs and/or sales tax charges when comparing with local retailer pricing.

If you really love hardware, researching your DIY PC project can be an adventure in itself, not to mention a real cost saver. But don't expect it to protect your knuckles. A little blood still goes a long way. ∎

Speak your mind and the rest will follow...joan@cpumag.com

Starting as gopher for the Emmy-winning team that pioneered live in-car TV cameras for the Indy 500, Joan became an independent video/sound engineer, technical director, and producer. Playing with Reality Engines and motion platforms led to co-founding Xatrix Entertainment where she produced the two Cyberia games. Before 3-D acceleration was trendy, she formed Mango Grits to develop hardware-only game Barrage forActivision. Since cashing out from SharkyExtreme.Com, where she was co-founder and managing editor, Joan has retired.

RARELY DO YOU GET TO USE THE WORDS "INGENIOUS"
AND "MUSCLE-BOUND" IN THE SAME SENTENCE.

Introducing the all-new Chevy Avalanche with its exclusive Midgate.™ The only vehicle that changes from an SUV

full-size pickup. chevy.com/avalanche   **AVALANCHE**   **LIKE A ROCK**

Inside Netflix

Ditch The Late Fees For DVD-Movie Watching The Way It's Meant To Be

No more video store rentals for us bona fide movieholics. No more shallow selection, limited DVD availability, and late fees. And no more quasi-literate, half-stoned, school-aged store employees fumbling with the checkout register.

"You want fries with that?"

"Dude! Snap out of it. You're not at Burger King anymore. It's the video store job this week."

These sort of futile exchanges are a thing of the past at our new-and-improved video store: the mailbox. It's almost always filled with the DVDs we really want to see, and it's never rude, uninformed, or remotely glassy-eyed. Like other Webheads, we have become unabashed Netflix junkies.

Lights, Camera, Action

Netflix (www.netflix.com) is a DVD rent-by-mail service that marries Internet savvy and marketing genius with the trusty reliability of the post office. For a $19.95 monthly subscription, members rent DVDs online, receive them via mail, and keep them as long as they want.

The online storefront has virtually every nonporn DVD title possible (that's 11,000 for those counting), and there are no, I repeat, no late fees—the scourge of movie fans everywhere, and the principal reason why Blockbuster continues to draw a profit. At the Netflix Web site, members maintain a personalized rental queue, or a ranked list of DVDs the member wants to rent.
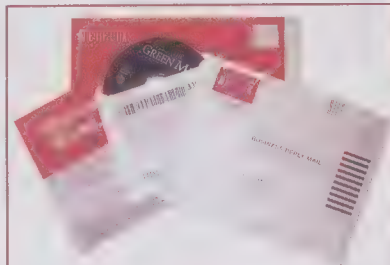

Netflix CEO Reed Hastings

Netflix uses mailers to bring new movies to your mailbox. The mailer converts into a prepaid return mailer you drop in your mailbox to return a DVD.

As you return discs, the company automatically sends the next available choice from the queue, letting you have up to three DVDs at a time.

Yeah, we didn't get it at first, either. Twenty bucks a month for DVDs? Return

Netflix employees inspect every returned DVD for damage before passing it on to the next customer.

them by mail? Even the head PR honcho at Netflix admits the company's model is tough to grasp.

"It's very unusual getting used to the subscription-based, $20-a-month idea," says Rick Sneed, director of corporate communications. "It's hard for people to get their head around it."

For us, too, until we got our first set of movies two days after signing up online. DVDs come in a light, flat, first-class mailer without the familiar DVD packaging. A prepaid return mailer is included, so when you finish a flick, you just pop it in the envelope and raise the mailbox flag. No stamps, trips to the post office, or video store employees. And with new DVD releases renting for up to $4.75 at many retail video shops (not counting the inevitable late charges), that $20 monthly fee starts to look like a bargain to film nuts like us.

Becoming a Netflix member is something like discovering necking in high school. The first couple of months, you can't get enough. New members rent DVDs at a frantic pace, plumbing the depths of the Netflix library, which not only has 40,000 copies of John Travolta in "Swordfish" but also the entire Buster Keaton silent comedy oeuvre. After a breathless honeymoon of renting three DVDs at a time for the first few weeks, most members settle into a calmer matrimony, renting five to seven discs a month, one at a time, says Sneed. There are the hopeless media addicts (er, that would be us) that rent 12 to 15 movies a month. Those probably are the members who have indeed confused movie watching with a

Competition? What Competition?

Netflix insists that it recently hasn't even approached the size and security of its original rent-by-Web model. That hasn't stopped them from trying, however. Among the leading Netflix alternatives are: KozmoDVD (www.rentmydvd.com) undercuts Netflix pricing with a $13.95 (two DVDs out per month) plan and a pay-in-one-go fee that gives you a DVD for new nights for $3.95; DVDOvernight (www.dvdovernight.com) lives for a la carte plans only. There is no subscription fee, but users pay $4 to keep a rental from the day it arrives in their mailbox.

romantic life. Um . . . this is probably us, too.

Not surprisingly, Netflix's membership has grown exponentially from 40,000 in early 1999 to 400,000 by the time you read this. Amidst a landscape of over-hyped, cash-burning, and crashed dot coms, this well-funded company is on the verge of profitability only three years after being founded.

DVDs By The Truckload

Pull back the curtain on this ingenious rent-by-Web model and Netflix looks even more intriguing. How can a rental company afford to let members keep a DVD as long as they want?

"We get the movies virtually for free," says Sneed, "so it doesn't matter how long you keep it." Netflix only pays to duplicate the disc. It then gives a share of the revenues back to the appropriate Hollywood studio when a member rents the movie.

"Since we don't own the disc, we don't have to make as much cost back on it," says Sneed. In fact, it's better for Netflix financially if users keep DVDs longer because the postage fees constitute the highest cost in the process. When members keep movies longer, they can rent fewer titles,

Only about 10% of DVDs returned to Netflix make it back to a storage shelf. Almost all returned discs are turned around immediately to other customers.
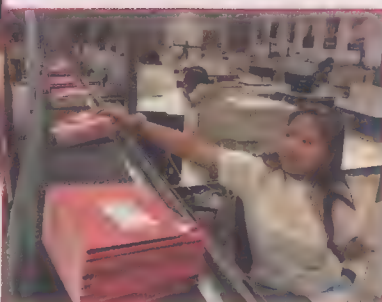
Inside the Netflix DVD machine, employees move thousands of DVD mailers out the door every afternoon and process 80,000 to 120,000 returns a day.

requiring fewer mailings. "What is perceived as a big benefit for the user—no late fees—is a big benefit for the company, too," says Sneed.

The Netflix fulfillment process is as novel as the business model. It starts at 5 a.m. when company trucks visit the San Jose, Calif., post office to pick up the 85,000 to 120,000 DVDs returned daily. At the 55,000-square-foot Netflix operations center, 50 to 60 workers open the mailers to check the DVDs for damage, rerouting problem discs to a quality control group. As the returns are logged into the company computers, several things happen. Members receive an e-mail acknowledging the return and are asked to rate the movie for the Netflix database. Like Amazon.com, Netflix's Web site is a sophisticated affinity engine, using a member's previous ratings and rental habits to recommend DVDs

that follow previously declared tastes.

Meanwhile, back at Netflix operations, it's likely that a returned DVD won't touch a warehouse shelf. "Over 90% of the movies that come in, someone else wants, and so it goes right back out," says Sneed. Users are encouraged to maintain large rental queues, so that at any time a given DVD is on a member's want list. Because the company started its revenue-sharing program with all the major movie studios, Netflix can stock 25,000 to 40,000 copies of new, popular titles. A staggering 2.5 million discs are in the Netflix system, and 90% of users now get the first rental choice, Sneed claims.

Unlike many dot-com startups, Netflix hasn't crashed and burned. Nevertheless, it shares Silicon Valley's legendary casual office culture. "I'm sitting here in mountain boots, shorts, and a T-shirt as I talk to you," Sneed says from the Los Gatos headquarters.

"We enjoy being a team together," says CEO Reed Hastings, who fields and rejects buy-out offers almost every week. **CPU**

by Steve Smith

The Blockbuster Epiphany

A Chat With Netflix CEO Reed Hastings.

CPU: How did you dream up the Netflix model? Was there a traumatic video store incident in your past?

Hastings: I had a $40 late fee for Blockbuster. I am there thinking 'There's got to be something better.' It was like, 'Wow we should do this where there is no late fee.'

CPU: With DVD burners and broadband connections widely available, are downloadable DVD rentals on your radar screen?

Hastings: Yes. It's the reason we named the company Netflix and not DVD-Rentals-Something. We want to get to 3 or 4 million subscribers and then start rolling out the broadband delivery to various kinds of devices. We think we can afford to not be the first one to do that. It's very expensive work to seed the market to get the first 50,000 people used to downloading movies for their entertainment and paying for them.

CPU: Surely Blockbuster and Hollywood Video are not

going to stand still for what you are doing. Or are they just dinosaurs?

Hastings: If they were dinosaurs they might be more reactive, but they're actually doing quite well. We're not going to be bigger than Blockbuster with online (service). That will be 20% of the market and that's $2 billion in revenue, so that's a big prize for us. But we're not kidding ourselves that we're going to overtake Blockbuster. They did about $5 billion in rentals and we're going to do a little under

$100 million, so we're still pretty tiny compared to them.

CPU: What DVD did you watch last night?

Hastings: "Going All the Way," which was an early Ben Affleck. It was a recommendation from our taste-matching engine. I would never ordinarily order the movie because I've never heard about it. The average rating on it was 2.5 stars, but Netflix predicted that I would rate it 4.5 stars because of similar movies I have rated. So I watched it last night, and I loved it. ▲

by William Van Winkle
Graphics & Design by Carrie Benes and Jason Codr

Good Enough For Bond, James Bond

Personal-Security Gadgets To Keep You & Your Stuff Safe

Whether you travel by land, sea, or air, keeping yourself and your belongings safe can be a real challenge. Enemies are everywhere, be they sticky fingers, prying eyes, or your own bad sense of direction.

Take a hint from the man who takes his security very seriously. No, not G. Dubya. Bond. James Bond. Over the years, our favorite spy has used a myriad of (literally) cutting-edge electronic gadgets to free himself from harm's evil clutches. You may not find yourself orbiting above the ionosphere or plummeting from a cliff top anytime soon, but you just never know. It doesn't hurt to think like a secret agent and be ready for anything.

We've found a gaggle of 007-worthy gadgets that don't require a government-backed R&D lab. These devices aren't just high-tech novelties, they're products you can put to good use to foil your foes. OK, maybe they'll help you be a bit more productive, too.

Targus DEFCON 1 Notebook Security Alarm

Attach this three-digit combination lock to your computer bag, turn on the motion sensor, and feel free to lose yourself in the morning paper while waiting for your plane. If someone cuts the 4.7-foot steel cable or the sensor detects excessive motion for more than four seconds, DEFCON 1 ($49.99; www.targus.com/accessories_security.asp) emits an 110dB scream certain to either stop the perpetrator in his tracks or send everyone within earshot running for the nearest fire exit. Notebook theft is a persistent problem, and once the notebook is gone, Targus states 90% are never recovered. The DEFCON 1 is small (5 inches x 2.15 inches x 1.5 inches) and unobtrusive, but highly effective. The unit is designed for notebooks but works as well on luggage or other personal items.

Ph3000mkIV Ultra Miniature High Performance Color Pinhole Camera

When you're away, who's keeping an eye on your family or the top-secret files in your desk? With this Lilliputian pinhole camera strategically placed in an air vent or closet and linked to your VCR or computer, you can see it all. The Ph3000mkIV ($385; www.spycompany.com /video.htm) is the smallest fully featured camera you can buy, with an amazing 420 lines of resolution for sharp, clear color images. Use the camera as the backbone of a Web surveillance system to toggle between camera views from any Internet-enabled terminal, even when you're a continent away. Imagine the house sitter's surprise when you call and say, "I'll make you a deal. Put down the leftovers and I'll let you live."

Casio WQV3D Wrist Camera Watch

The mini camera—hidden in a pen, tie, or watch—has been a staple of every spy story practically since the genre's inception. How excellent is it to live in the 21st century when such a camera finally is a reality? The Casio WQV3D Wrist Camera ($229.95; www.casio .com/watches) is capable of storing up to 80 JPEG color images (176 x 144) and beaming them back to your PC via an infrared sensor. Not just a cool toy, the monochrome display-equipped camera lets you capture on-the-scene images of accident damage or snap photos of an attacker or thief. It's like having a little eyewitness right on your wrist. If you're really lucky, the perp will stand still and pose.

Ericsson R380 World Smartphone

Many people carry cell phones for use in case of emergency. But how many carry a cell phone that's also a personal organizer and Internet browser and can be used across all GSM services on five out of seven continents? The R380 ($499.99 plus monthly service fee; www.sonyericssonmobile.com) offers features like SMS, a built-in modem, Symbian's EPOC technology, and synchronization with major desktop PIMs, not to mention a display that supports 22 languages, guaranteeing you can blend in and stay connected wherever fate lands you. When not in use as a phone, the faceplate flips down to give you access to a large, graphics-rich display screen. Secure e-mail, voice-activated dialing, infrared communication with other devices, and more bundles in this nondescript communications powerhouse. About the only thing you can't do with it is drive your car.
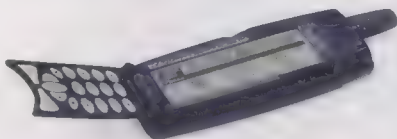
Rigel 2100 Night Vision Binoculars

Once used primarily by the military and secret agents, night vision technology is now readily available to civilians who want to use in the dark. Whether hunted or hunter, you'll benefit from the ability the Rigel 2100 ($489, www.rigeloptics.com) gives you to see up to 170 meters on a cloudless night with 2.7 magnification and a 20 degree field of view. Resolution is 28 ln/mm, and the lenses can be changed out. High-powered infrared illuminators that provide extended viewing distance even in pitch-black conditions, normally an optional accessory, come standard. This model is especially small and weighs just more than one pound for easy portability.

Ankari BioMouse Plus

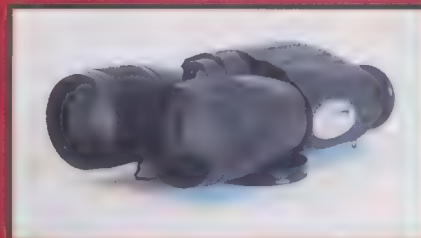If your notebook is stolen while you're on the road, how secure is your network access? When your company uses the BioMouse Plus ($199; www.ankari.com) in conjunction with Ankari's Trinity authentication software, you can be certain that the only person who can log in to your account is you (or someone in possession of your finger). The BioMouse Plus is a combination smart card reader and fingerprint scanner. The card holds your personal information, and your fingerprint stands in place of a PIN or password that can be forgotten, stolen, or cracked with freely available hacking software. The BioMouse attaches to your system via serial or PC Card port, so for the sly road warrior, this four-ounce treasure easily attaches to any portable to bestow peace of mind.

Motorola V Series
Personal Communicator Model 100

When you're keeping a low profile and need to communicate discreetly, the Motorola V100 Personal Communicator ($179 plus monthly service fee; www.motorola.com) is just the gadget for the job. This pocket-sized, two-way clamshell pager uses an illuminated QWERTY keyboard for text messaging and headset for GSM 1900-based phone calls. The V100 also gives you access to the Internet, has voice recognition for hand-free dialing, and a voice recorder to capture important thoughts or an entire phone call. Part "Star Trek," part "Tomorrow Never Dies," this unit even offers a VibraCall mode to make sure you're shaken, not stirred.

Clarion Ungo

Who doesn't hate car alarms? Obnoxious and temperamental, even the model in your own vehicle is often more trouble that it's worth. However, Clarion's Ungo MS2007 ($499.99; www.autopc.com) is more than a simple car alarm. It's an all-out security system. With the LCD remote you can start the engine, enable or disable the alarm, lock/unlock the doors and trunk, and order a pizza. (OK, not really order a pizza.) With built-in two-way communications, you can also monitor your car's status from up to 500 feet away. If enemy forces try to raid your wheels, the system will immediately send you an emergency page so you can come running and whip out some judo chops.
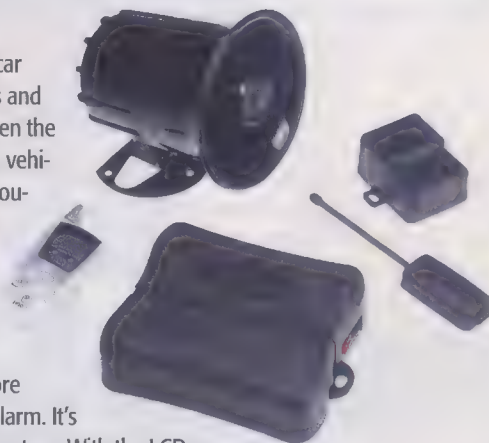
Garmin eMap GPS

Part of staying safe is knowing where you are at all times. Any gadget geek worthy of the title needs a GPS unit, and the eMap ($242; www.garmin.com) rolls over most competitors. The eMap is about the size of a small calculator, weighs only 6.7 ounces, and has a large 160 x 120 grayscale display. The unit uses 12 channels to pinpoint your location within 15 meters. It comes loaded with a base map covering North America and South America, which can be supplemented by downloadable MapSource CD-ROMs covering everything from grungy rendezvous diners to elite international destinations. If you want to get off the road, you'll want MapSource's U.S. Topo database. Otherwise, the unit is intended mainly for use as a replacement paper map. On tarmac, though, eMap frees you from ever having to stop and ask for directions again—as if you would, anyway.

Sharper Image Travel Companion Plus

Whether you're staying at the Ritz or the No-Tell Motel, you'll sleep better with this handy combination motion sensor/smokedetector /travel alarm/flashlight. Hang it from your door or window, and anyone trying to get in will be met with an 110dB alarm, making it imperative that you put out the Do Not Disturb sign to warn away housekeeping. A different alarm will sound if smoke is detected, and the clock/flashlight unit separates so it can sit within arm's reach on the bedside table. Although one would hope you don't need every Travel Companion ($59.95; www.sharperimage .com) function in any one night, it's nice to know you're prepared if you do.

An Agent Needs A Smooth Ride

Bond has been known to drive the occasional BMW—including the sporty Z3—so maybe he'll want to look at the BMW 7 Series (base prices start at $70,000; www.bmw.com) in the future. Although the all-new 2002 models will no longer offer an optional protection package (with bullet-resistant body panels and glass), the safety/security systems have been enhanced across the board. Onboard GPS navigation, a built-in cellular phone system (that includes a Mayday option to automatically call for assistance if the airbags deploy), and voice control over many of the command functions are just a few of the great high-tech goodies you'll find here. Add the optional break-resistant security glass to guard against occasional flying bodies and you'll be ready to go.

More Gear, Fewer Transistors

These gadgets don't rely on computerization to get the job done, but they're still great for securing your stuff with a high cool factor to boot.

Pelican Notebook Security Case

Watertight, dust-proof, and dent-proof, the Pelican ($236.95; www.pelican.com) notebook case is the best protection you can give your notebook. A shock-absorbing tray cushions any blows and a keyed locking latch keeps prying fingers at bay.

Spy Sunglasses

The next best thing to having eyes in the back of your head is having spy sunglasses ($7.95; www.securityandindustries.com/spyglasses.htm), glasses that let you see what's going on behind you. A special coating on the lenses gives you both forward and rear vision to help you stay vigilant.

Door Stop Alarm

$11.95

Slip this baby under the door and night intruders won't stand a chance. Pressure against the sensor wedge will set off an 125dB ($11.95; www.securityandindustries.com /alarm.htm) alarm sound.

Bond & His Gadgets

Thanks to the talented Q, James Bond is always outfitted with state-of-the-art gadgets to help him complete his assignment and get the girl. Check out these James Bond fan pages for a look at some of the fictitious gear inspiring today's real-life products:

- Bond Gadgets
  http://jmsbond.tripod.com/gadgets.html
- The Bond Gadgets
  http://extra.gamespot.co.uk/pc.gamespot/features/bond/gadgets/intro.html
- 007 James Bond - James Bond's Gadgets
  www.bond.00go.com/films/gadgets.htm

by Chad Denton

Road Warrior

Remembering Al Franken, Danger Lurking & More From The Mobile Front

Dangerous Devices

Danger (www.danger.com) may soon offer hardware that's as cool as its name. The startup is working on a device it hopes will be a BlackBerry killer. Danger unveiled its hiptop wireless device at DEMOmobile in September. In October, the company announced it has secured another $36 million in financing.

Danger could be a company to watch if it can deliver everything it promises with the hiptop. The device looks similar to a two-way pager with a small keyboard and grayscale display. However, the hiptop includes support for voice and data, letting users place calls, send instant messages, and surf the Web. Users can also send and receive e-mail with attachments. Although there was no specific information on which attachments are supported, we do know the device will support image attachments. A camera accessory will let users take pictures and e-mail them to friends and family.

Rather than sell devices direct to consumers, Danger plans to work with wireless carriers to distribute the hiptop. At press time, Danger had yet to announce partners. Price was also not available, but Danger promises an "affordable solution." Hopefully it doesn't mean affordable for CEOs. ▲

Wireless Speeding Up

For those who think 11Mbps is too slow, 802.11a is finally beginning to hit the market. In November, Intel (www.intel.com) launched its new PRO/Wireless 5000 series of products with speeds reaching up to 54Mbps. Speed isn't the only advantage 802.11a offers. The 5GHz band the technology operates in is clear from interference, unlike the 2.4GHz band used by the 802.11b specification. Technologies ranging from cordless phones to Bluetooth crowd the 2.4GHz band. Naturally, 802.11a isn't backward compatible with 802.11b. Other 802.11a gear on the market includes Intermec's (www.intermec.com) MobileLAN access 2106 and Proxim's (www.proxim.com) Harmony 802.11a FastWireless Kit. ▲

Additional Treo Details

Last month we mentioned that Handspring (www.handspring.com) recently announced its long-awaited Palm OS mobile phone, the Treo 180. Visto (www.visto.com) has since announced it's partnering with Handspring to deliver e-mail management software for automatic delivery of e-mail messages and tight integration with Microsoft Exchange e-mail servers. The software will include remote management of e-mail so that changes made on the PDA are reflected on the Desktop. Deleted e-mail on your Treo will immediately delete from your Desktop. ▲

> Sony finally announced an OS upgrade for its CLIE PEG-N710C. The catch is that the upgrade costs $50 and requires you return your CLIE to Sony.

CLIE Users Get An Upgrade

Sony's CLIE PEG-N710C is one of the coolest Palm OS devices available. The N710C can play digital music files, videos, and access content stored on a Memory Stick. Unfortunately, the Palm OS version the N710C bundles can handle only 256 colors, even though the hardware can support more than 65,000 colors. Because the N710C includes flash memory, it wasn't surprising in October when Sony offered a Palm OS upgrade to remove the color limitation. The upgrade from Palm OS 3.5.2 to Palm OS 4.1 enables 16-bit color and provides some other modest improvements. The catch is that Sony is asking N710C owners to return their units to Sony for the OS upgrade. For $50 (shipping and handling included), users get the upgrade and a CD-ROM with fresh applications. ▲
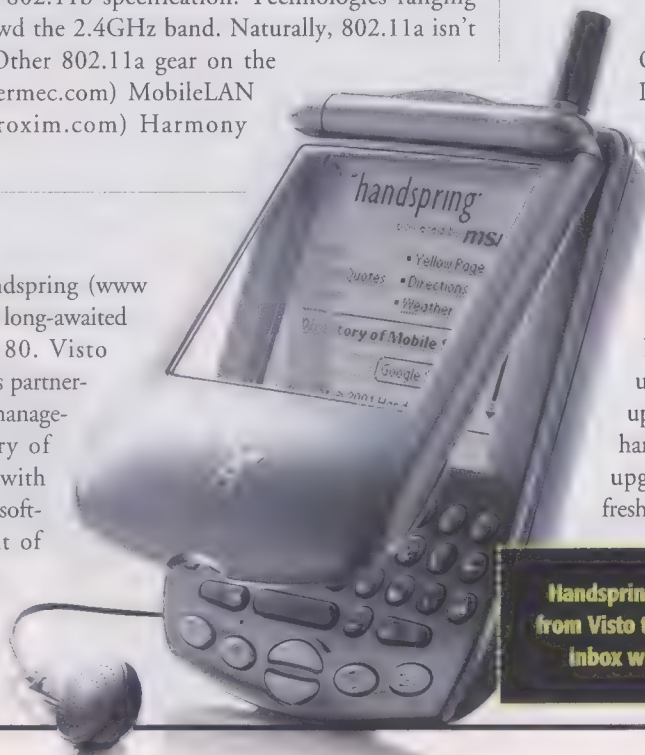
> Handspring's Treo will use software from Visto to synchronize your mobile inbox with your Desktop inbox.

Data In The Air

In other news involving Sony, the company is looking to make it easier to get wireless service on a CLIE PDA. Sony's new MYLO (My Life Online) service will bundle hardware with service from GoAmerica.

Hardware includes a Sierra Wireless AirCard 300 PC Card and a PC Card adapter that clips to the bottom of the CLIE. The adapter features a pass-through port that lets you recharge your CLIE's batteries and synchronize the CLIE without having to remove it from the adapter.

Software includes a one-stop solution for browsing the Web and messaging services. The Air Card 300 relies on CDPD wireless networks and can transmit data at up to 19.2Kbps. Because the Air Card 300 is a standard PC Card, it will also work in notebook PCs. Service starts at $39.95 a month for the CLIE, $59.95 for notebooks, and $79.95 for service on both a CLIE and notebook. The hardware costs $299 but users will receive a $100 rebate when they activate their service.

In October, Motient (www.motient.com) announced its own wireless PDA modem. The modem clips to the back of the Palm V/Vx and lets you use Motient's eLink service. Using eLink, you can forward e-mail messages from a standard POP3 or IMAP account to your Palm unit. You can also set up a separate mobile e-mail account. The MobileModem automatically receives new e-mails and can alert you the instant new messages arrive. The MobileModem is available for $179 with a one-year service contract when you order via Motient's Web site.

Motient's network operates at the same 19.2Kbps speed as existing CDPD networks, but the network has more extensive coverage. Where some states completely lack CDPD coverage, Motient's network is available in at least parts of all 50 states. According to Motient, the company's network covers about 99% of the top 565 most populated U.S. cities. ▲

A Better One-Man Mobile Uplink Unit

Al Franken was "Saturday Night Live's" one-man mobile uplink unit reporter, delivering news from the world's hot spots to Weekend Update anchor Dennis Miller. A huge satellite dish on a helmet on Franken's head left him too empowered by technology to grasp the gravity of his situation and too encumbered to run from trouble. Franken will be glad to know similar technology is now available to journalists, only in a much more portable form.

U.K.-based 7E Communications' (www.7e.com) Talking Head-1 (TH-1) is one example of a more forgiving one-man mobile uplink unit (commonly referred to as a videophone). The TH-1 can send video and audio to a receiver over an ISDN line or via Inmarsat (International Maritime Communications Satellite). Inmarsat is a system of geostationary satellites put in orbit to provide telephone service for ships at sea, but it can handle data from behind enemy lines just as well. The TH-1 is a completely self-contained package measuring 6.1 inches high x 14 inches wide x 10.4 inches deep and weighing 12 pounds.

Bandwidth is limited. Sending video requires balancing length, quality, and transmitting time. It's possible to send high-quality prerecorded video, but the longer the clip and higher the quality, the longer the transmission time. Live feeds at lower quality result in the choppy live videophone feeds we've seen out of Afghanistan. Nonetheless, videophones are invaluable to reporters in hot spots, and the technology will improve. Admittedly, this is extreme mobile technology for now, but it lets us imagine what might be in store in 10 years. ▲

What You'll Give Me For A Pilot 1000?

Don't throw your old, broken Palm away just yet. Palm (www.palm.com) is offering money back for broken Palms, provided you help the company clear some stock from its warehouse by buying another old Palm. By contacting Palm's technical support (847/262-7256), you can receive a special promotional code entitling you to a discount on Palm models, including the Palm Vx, m100, m105, IIIc, and VIIx (sorry, not for the m125, m500, or m505). You need to enter the provided code to receive the discount. ▲

Motient's MobileModem lets Palm V/Vx users send and receive e-mail and surf the Web. Motient's network is more widely available than CDPD networks used by most other Palm wireless modems.

Penguins Everywhere

The IBM (www.ibm.com) Linux wristwatch took a step closer to market reality in October when Citizen Watch (www.citizenwatch.com) and IBM announced the first WatchPad prototype, jointly developed by the two companies. IBM has been demonstrating its prototype Linux wristwatch for some time but has concentrated more on demonstrating the flexibility of Linux than exploring commercial opportunities for a computerized watch.

Citizen Watch has contributed design aspects of the watch, including the display and input device, while IBM has contributed the hardware and software. Both companies plan on sharing WatchPad technologies with interested universities in hopes of accelerating development. ▲

Compiled by Samit G. Choudhuri & Chris Trumble
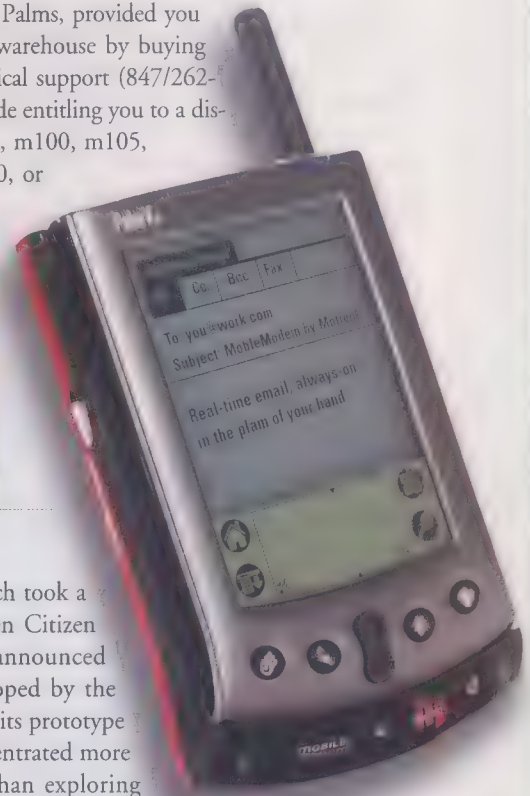
At Your Leisure

Plug In, Sit Back & Fire Away

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in game consoles, games, PCs, DVDs, and just stuff we love, read on.

ICO: It Ain't Easy Having Horns

Sony Computer Entertainment's ICO for PlayStation 2 is a story about a boy (Ico) who has the exquisite misfortune of being born with horns. In Ico's village, that's a big no-no. Boys are born with horns only once each generation, and the villagers have taken to sacrificing them by locking them into tombs in a deserted castle. Ico manages to break out of his tomb in the game's opening sequence and finds a young lady who speaks another language locked in a cage suspended high above the castle floor. With a little ingenuity, he's able to free her.

Shortly afterward, you find out the castle Ico's loving villagers have locked him in is inhabited by shadowy, evil creatures that want very much to capture the girl and don't mind hurting you in the process. From this point on, the game becomes a search for a way out of the castle with occasional interruptions to fight off its dark inhabitants.

Ico can run, jump, climb, and swing on things and even push large objects, while the girl can overcome certain obstacles Ico can't. In other words, you'll need to use both characters' abilities plus a heaping helping of your own wits to make your way through (and hopefully out of) the castle.

ICO reminded me a lot of Prince Of Persia, one of my favorite games from back in the day. It's not an action extravaganza, but it is a great-looking, atmospheric adventure game that will keep you coming

Ico (the boy with horns) and the castle (the castle).

back for more with a unique blend of exploration, puzzle solving, and combat. ▲

ICO (PS2)

$49.99
Sony Computer Entertainment America
www.us.playstation.com

Check These Out On The Web

Check out our reviews of **Extermination** (PS2), **Okage: Shadow King** (PS2), and **Onimusha: Warlords** (PS2) at www.smartcomputing.com/cpumag/jan02/gamereviews. ▲

Some of Okage: Shadow King's interesting, cartoonish characters.

Samanosuke prepares to put a serious whuppin' on several demon-possessed warriors in Capcom's Onimusha: Warlords.

Extermination's auto-aim feature makes it easier to hit targets over long distances and in combat situations where multiple targets are present.

Silent Hill 2
Check Your Sanity At The Door

Looks like the washroom attendant has the day off. Many of the environments in Silent Hill 2 have this dirty, dark, and somewhat twisted look about them.

The long-awaited sequel to a 1999 PlayStation hit, Silent Hill 2 hit the PlayStation 2 in September. The game's story centers on your character, James Sunderland, a man who receives a letter from his wife, Mary. Mary writes that she's waiting for James in a special place in Silent Hill, a town the two visited together some years ago. The only problem is that Mary has been dead for three years.

When you pick up the action, James has driven to the outskirts of the misty and altogether unnerving town to unravel this mystery, only to find that the roads into (and out of) the town are impassable. A series of huge barriers block some, while enormous gaping holes in the earth that look like cave-ins have claimed others. With your help, James makes his way on foot into the town and a whole mess of trouble.

You find Silent Hill almost completely deserted except for a handful of characters you bump into from time to time and a disturbing menagerie of shambling, shrieking, monstrosities that look like they were once human. The other "normal" people are in Silent Hill for their own reasons, but in many cases your interaction with them reveals important clues. The creatures you see staggering about aren't friendly, and James spends some of his time in Silent Hill fighting for his life. Control during combat is a little awkward, but surprisingly this serves only to heighten the sense of urgency and doesn't detract at all from the fun.

You'll venture through creepy streets, a hospital, a lakeside park, and a number of other locales that would be quite pleasant in a normal town. As in the original, Silent Hill 2's dark, foreboding graphics (some of the best yet on any game console) and artfully blood-chilling sound effects will have your heart thumping while your mind struggles to make sense of James' plight. ▲

Silent Hill 2 (PS2)
$49.99
Konami
www.konami.com

Ace Combat 4: Shattered Skies
Get Your Top Gun On

Namco's Ace Combat 4 is a sort of flight sim/shooter amalgamation with just the right blend of realism and arcade action. For example, you can take off and land on occasion if you want (you even get to land on a carrier at the end of one mission), but you can just as easily press Start and skip such sequences. In addition, Ace Combat holds you to certain physical truths, such as the tendency of planes to stall if you throttle back too far during certain maneuvers, but lets you thumb your nose at others: Some planes can carry nearly 80 air-to-air missiles at once.

If a plane equipped with 80 missiles (plus whatever air-to-ground weapons you choose) sounds ridiculous, keep in mind that the planes that accompany you into combat are mostly window

Ace Combat 4 puts you in control of the most sophisticated war machines ever created, but don't worry; you won't have to take lessons to earn these wings.

dressing. Your comrades occasionally get shot down (and sometimes they even shoot down enemy planes), but they mostly fly about spouting such absurdities as, "Watch me earn my ace wings today!" and "Dammit! I'm not going home in a body bag!" Make no mistake, when it comes right down to it, each battle hinges on you.

Your character, known only as Mobius 1 (your call sign), is part of an allied rebellion to overthrow the occupational forces of a neighboring country that has taken over the fictional continent of Eugea. You start out flying a vintage F-4 Phantom, and as you complete missions, you'll earn money you can use to buy better planes and more advanced weapons. There are 18 missions in all and 21 planes you can use as you are able to afford them. The game is gorgeous and a blast to play; if you're into flight sims or shooters, give this one a try. ▲

Ace Combat 4: Shattered Skies (PS2)
$49.99
Namco
www.namco.com

Aliens Versus Predator 2
An Atmos"fear"ic Feast

"Open those doors and scout the perimeter, soldier."
"Sorry mate, er, *sir*. I'm a wee bit afraid of aliens."

Remember the giddy horror of watching the Face Hugger emerge from Kane's abdomen in Ridley Scott's "Alien"? How about the thrill and suspense of James Cameron's "Aliens" and John McTiernan's pre-"Die Hard" "Predator?" Alien Versus Predator 2 (AvP2) for the PC will have you feeling the same emotions you enjoyed in these classics.

Monolith Productions, the development company behind the excellent No One Lives Forever has another success on its hands with AvP2. The original AvP, developed by Rebellion and released in 1999, reeked of atmosphere and let you

As the Predator, you can switch between viewing modes. See, hunt, and kill your prey. Good lad.

play as a Marine, Predator, or Alien. While enjoyable, the scenarios felt disjointed, and we never really felt any connection to the in-game characters. And the lack of an in-game save facility (until the patch was released, thanks to gamer flames) was a frustrating travesty.

AvP2 changes all that; not only does it retain the original's eeriness, but gameplay and storyline show some marked improvements. There are some problems, though. Early in the Predator game, we killed a soldier near an outcropping. Instead of falling to the ground below, he hung suspended like some sleeping Superman—quite disconcerting. The same clipping problems rear their head elsewhere; as an Alien, it was not uncommon to get stuck in some spots. It would be nice to see Monolith fix these problems in a patch.

Games such as Half-Life show their influences with scripted in-game events that occur during gameplay. These events are well executed, and they immerse the player in the game world as a part of an ongoing story line. Never underestimate the power of good storytelling.

The LithTech 2.5 engine looks good, and fantastic audio adds atmosphere. Playability (clipping problems aside) is not lacking. The developers tweaked the control scheme to make controlling the Alien more intuitive, and having three races that are equally fun to play is a design triumph. Each race has its benefits, and coming to grips with your chosen race is a pleasure.

AvP2 isn't a breakthrough title, but it *will* have you jumping in your seat and sweating bullets. Action game fans should not pass this one up. Turn the lights down, crank up the headphones, strap on your Depends, and get ready for xenophobia. ▲

Aliens Versus Predator 2 (PC)

$49.95
Sierra/Fox Interactive
avp2.sierra.com

DVD Bytes

Read the full reviews at www.smartcomputing.com /cpumag/jan02/gamereviews

Christmas brings more than enough DVDs to empty your bank account. But let's not take the negative route; after all, all these cool DVDs give you plenty of opportunity to stuff your favorite stockings. We think these two will please DVD aficionados and kids alike.

Star Wars:
The Phantom Menace

With the release of "The Phantom Menace," it's one DVD down (for now) and three more releases to go. Don't get your hopes up though; the original "Star Wars" trilogy isn't slated

for DVD release until after Lucas has the next two prequels in the bag. But until then, you have the first-ever "Star Wars" DVD release to tide you over until 2006.

It's possible that the movie didn't meet your expectations in the theatre, but this release does warrant your attention. Here's why: You get a great 2.35:1 anamorphic transfer with an audibly stunning Dolby Digital 5.1 EX mix (THX-certified, of course). Not only is the A/V quality stellar, but you also get

extended scenes added directly into the movie. Now we just have to patiently await "Episode II: Attack Of The Clones." Get more details by visiting www.starwars .com/episode-i.

Shrek

What do a green ogre, talking donkey, beautiful princess, and evil prince have in common with Mike Myers, Eddie Murphy, Cameron Diaz, and John

Lithgow? Shrek (as the tagline reads, "the greatest fairy tale never told"), of course! The movie that clobbered Disney this past summer is now available as a special edition dual-DVD package.

It would be an understatement to say that Dreamworks Home Entertainment has a winner in its hands. Watching the movie is only half the fun; you'll have hours of fun with the goodies. Visit www.dreamworks.com to learn more.

Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Who needs eye candy? Remember how awesome games like Alone In The Dark, Quake (3-D accelerated on Rendition's Verite), and Falcon 3.0 on a high-end i386 looked in their heyday? We know that great graphics don't hurt. There's nothing better than stellar gameplay combined with knockout graphics to make that killer game. These games have potential.

Tom Clancy's Ghost Recon (PC). This anticipated title from the company behind Rainbow Six: Rogue Spear should already be available as you read this. See those trees? They sway realistically in the breeze. Watching the soldiers? They behave intelligently (as do the enemies). Beware open terrain crossings on your way to www.ghostrecon.com during reconnaissance.

Infinite Loop

More Than Meets The Eye

- Average duration of a blink: 0.3 seconds
- Time it takes Google to search the Web for the word "eye": 0.11 seconds

- Number of colors the human eye can theoretically differentiate: 7 million
- Number of colors a 32-bit (true color) graphics card can theoretically produce: 4.29 billion

- Number of times the average person blinks per minute: 22
- Number of times the average computer user blinks per minute: 7

- Percentage of all computer workers with computer-related vision problems: 70 to 75

Sources: www.pbs.org/healthweek, American Optometric Association, http://faculty.washington.edu/chudler/facts.html, Google.com, National Institute of Environmental Health Sciences

Warcraft 3: Reign Of Chaos (PC). Looking better than ever and out before the summer, right Blizzard? Check out www.blizzard.com/war3 for info straight from the horse's mouth. Zug zug!

MACRO MANIA, PART II

Instant Access From Toolbars & Worksheets

IT'S A ROLLER COASTER LIFE. ONE MOMENT WORK SEEMS TO BE TRACKING ALONG SMOOTHLY, AND THE NEXT MOMENT, THE BOTTOM DROPS OUT. THINGS PICK UP SPEED, AND

demands from your boss (and everyone else) are coming at you faster and faster. But as panic begins to set in, you remember you have a trick up your sleeve: macros.

Macros are those recorded instruction sets that help you effectively deal with a busy schedule by letting you fly through your workload. How? By automating mundane or repetitive processes, such as preparing those monthly reports. In part one of this three-part series, we discussed how to record a series of menu commands or mouse clicks and save them as a macro.

You also saw how easy it was to play that macro back whenever you wanted by assigning a keyboard shortcut to it and how to edit the macro.

This month you'll expand on your knowledge in strategic ways. *Think efficiency:* You'll learn how to launch a macro with the click of a toolbar or worksheet button. (You might need to make running the macro easy for others, too.) *Think speed:* To make macros available whenever you fire up Excel, you can launch them automatically at startup. *Think high-end knowledge:* We'll take you on a quick tour of the Visual Basic Editor so you can view Excel's macro code. When you are finished, you will have the tools you need to even out the bumps and jolts at your workplace.

With The Click Of A Button

Imagine that every month you've had to track the products sold by your division and produce a report for your supervisor based on the information. The process was a real pain: You had to open the existing report, import new data from Access, sort the information by product line, add formatting, and then print it. Most likely, developing the report took more time than you wanted to spend on it, so you created a macro to

automate the steps. If you were especially on top of things, you remembered to include a description and assign a keyboard shortcut.

But even though assigning a keyboard shortcut to a macro makes it easy to launch, memorizing keyboard shortcuts for *all* the macros you'll probably develop gets overwhelming, even for you mnemonic lovers. To make life easier, you can attach the macro to a toolbar button. When you're working against a deadline, it's easier to click a button than to grope around the recesses of your desk (or mind) for a keyboard shortcut that seemed easy to remember at the time.

Toolbar time. You can attach a macro to a button on any *visible* toolbar, whether it's one of Excel's built-in toolbars or one that you custom created. To display the toolbar, right-click the menu bar and then choose the toolbar from the list.

After the toolbar is visible, choose Tools, Customize and then click the Commands tab. Scroll down the Categories list and click Macros. Drag and drop the Custom Button icon from the Customize dialog box to the toolbar. Just like that, the button is added to the toolbar. That's all there is to it, unless you want to change the button's settings.

With the Customize dialog box still open, right-click the toolbar button to display a comprehensive shortcut menu. Using the shortcut menu, you can tweak how the button operates. For starters, you may want to change the button's name. Highlight the existing text by the Name command (&Custom Button) and type an ampersand (&) followed by the label you want to assign the button. For example, if the button opens and prints that monthly report you loathe, you can type **&Monthly Report**.

Illustration: Andria Schultz

You can also choose commands on the shortcut menu to display only the button's text, the icon, or both. If you have lots of end users that will use the button, it's probably a good plan to display the button's picture and the text. The macro won't save you any time if you have to show everyone else where to activate it.

A new look. Sick of looking at Excel's default smiley-face icon every time you activate the macro that takes care of your most monotonous tasks? Quit whining and just change the image. Right-click the custom button and choose Change Button Image. Click the image you want from the palette.

If you are still not happy with the icon choices Excel offers, you can modify them. Choose one of the images and then select Edit Button Image from the shortcut menu. While it's not Photoshop by any stretch of the imagination, the Button Editor lets you change the color of an image and rearrange pixels as you please. If you really mess up, click Reset Button Image on the shortcut menu to start over.

Assign the macro. All this customizing would be for nothing if you didn't ever attach a macro to the button; by itself, the button does nada. To attach the macro, right-click the toolbar button and then choose Assign Macro. In the Assign Macro dialog box, double-click the macro you want before choosing OK.

If the macro you had in mind doesn't appear in the Assign Macro dialog box, click the Macros In drop-down list and choose another workbook where the macro might be hiding. After you create and develop the button, your work's essentially completed. Just click the button whenever you want to run the macro.
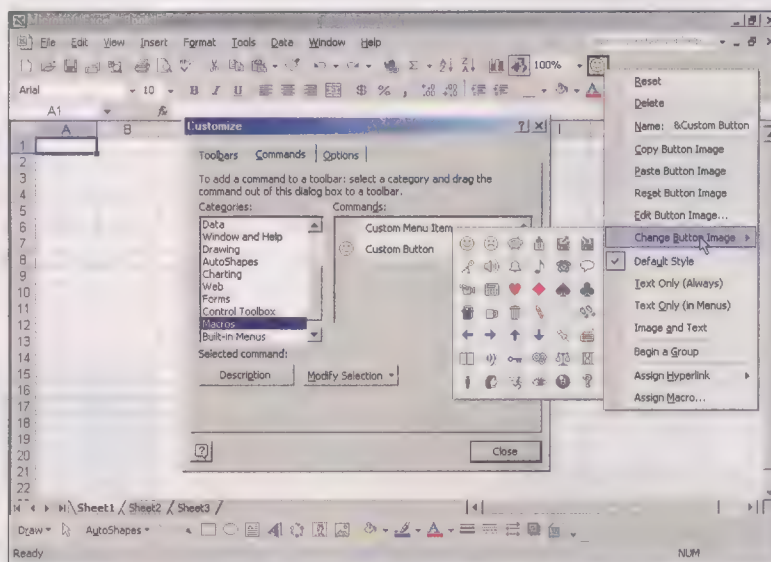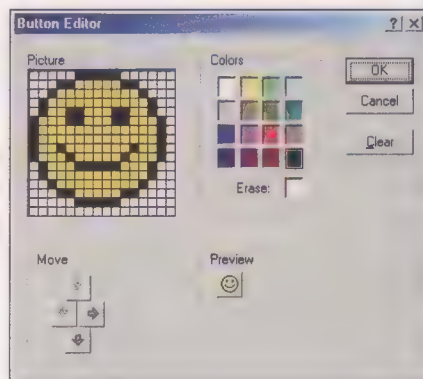
It's easy to change your macro's toolbar button image. If you don't like Excel's offerings (bottom), tweak one of the buttons to your specifications in the Button Editor (top).

A few final thoughts: You can edit a macro button's settings anytime. Reopen the Customize dialog box and then choose Assign Macro from the shortcut menu. In the Assign Macro dialog box, attach a different macro to the button by clicking it on the list. To completely unattach the macro, make sure it's highlighted in the Macro Name text box and then press Delete. Finally, if you're tired of the macro button appearing on a toolbar, open the Customize dialog box and drag and drop the button from the toolbar into Excel's workspace.

Worksheet Buttons

Instead of gluing a macro onto a toolbar button, it's also handy to create a customized button right on your worksheet. This way, the button is available whenever the workbook is open because the button is actually part of the worksheet instead of on a toolbar. (Hey, how many times have users in your office accidentally turned off a toolbar and then called you for help?).

First, create the button on the worksheet. Display the Drawing toolbar by choosing View, Toolbars, Drawing. You can use many of the buttons on this toolbar to create a button because its shape doesn't matter. You'll get the best choice of buttons on the AutoShapes submenu.

Even if you've never fooled around drawing objects before, you'll find the process straightforward: Click a tool (such as the Rectangle button) on the Drawing toolbar to activate it. Click and drag in your worksheet to create the exact size of object you want. If you aren't fussy about the size of the object, activate the tool and then click in the workbook where you want a default-sized object to appear. If you don't get the size of the object right the first time, you can resize it by selecting the object and dragging the resizing handles.

After you create the button, you're set to attach a macro to it. Right-click the button and choose Assign Macro. Choose the macro from the Macro Name list and then click OK. (You can also record a new macro on the fly by clicking Record in this dialog box. After you record the macro, right-click the button and choose Assign Macro again.) Once you've attached the macro to the button, click outside the button to deselect it.
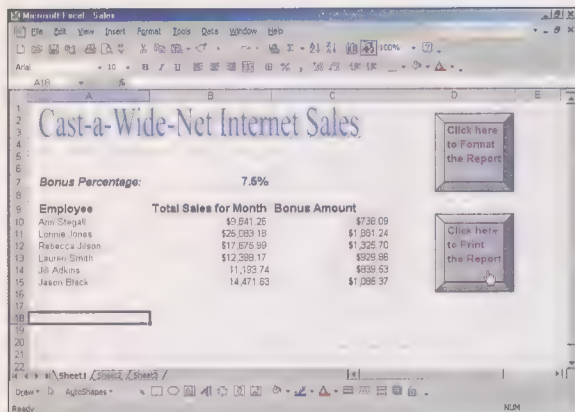
To run the macro, just roll your mouse over the button until the hand icon appears, then click. If you have recorded the macro correctly, everything will go smoothly, and it will run as you expect.

Tweak it. Things can go south, though, if you accidentally attach a different macro
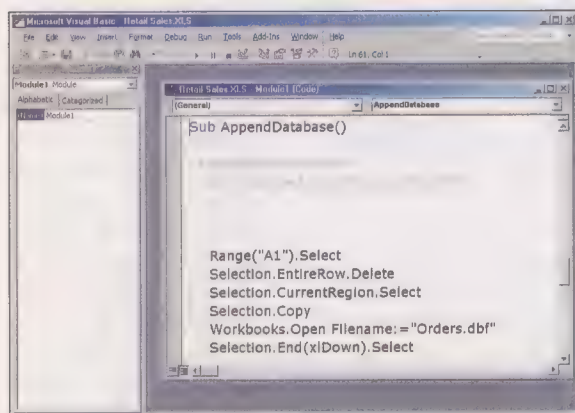
For maximum efficiency, place macro buttons right on your workbook instead of on a toolbar.

The Visual Basic Editor offers a look at what's going on behind the macro scene. We'll discuss VB in detail next month.

to the button than you intended. You can easily fix this mistake by right-clicking the button and choosing Assign Macro. Double-click the macro you want from the list. (To edit the macro itself, you'll use VBA, which we'll cover in more depth in the third installment of this article.)

You can also add some to-the-point text to the button so you (and others) can remember which macro will launch when you click a button. To do this, right-click the button and choose Add Text. Enter the text and then click outside the button to "cement" the text in place.

To jazz up the button a bit, try formatting it. Right-click the button's border and choose Format AutoShape. Choose the properties you want to modify (such as font, color, and lines) in the dialog box. Note that it's generally easier to format a button before attaching a macro because at that point, you can select the button and use tools on the Drawing toolbar, such as Shadow Style, Line Color, and 3-D Style, to change the object's look.

Finally, if the button's macro has universal appeal (such as a button that formats worksheet cells using your corporate colors), consider copying it to other workbooks so you and others will have it on hand for numerous tasks.

Automatic Launch

Remember that we mentioned in the first part of this series that you could save macros to the Personal Macro Workbook instead of the current workbook? Here's the big advantage of doing this: Macros saved in the Personal Macro Workbook load automatically whenever you start Excel because the file is stored in the WINDOWS \APPLICATIONDATA \MICROSOFT\EXCEL \XLSTART folder.

To make life even sweeter, you can move any workbooks you want to start up automatically into this folder. For example, if you have a great group of macros saved in the Sales Report workbook, use Windows Explorer to move this file into the XLSTART folder. To leave the workbook in its current location but still make its macros available to other open workbooks, select the file and then choose File, Create Shortcut in Windows Explorer. Move the shortcut (not the original file) into the XLSTART folder.

Go To The Source

So you know how to record a macro and how to attach macros to buttons in toolbars and worksheets for quick access. Now you're ready to go to the origin of macros: VBA (Visual Basic for Applications). This, of course, is the best way for you to communicate with Excel on its own terms. VBA is the name of the programming language Excel uses whenever you create a point-and-click macro. In other words, VBA automatically creates code that matches the actions of any point-and-click macro you develop.

To look at the code for any particular macro, you can use Excel's Visual Basic Editor. Choose Tools, Macro, Macros to open the Macro dialog box. Highlight the macro for which you want to view code from the list and then click Edit to display the Visual Basic Editor. To open the Visual Basic Editor without displaying the Macro dialog box, press ALT-F11. This lets you toggle between your open workbook and the Visual Basic Editor.

Get used to the feel of toggling to view the Visual Basic code because we'll spend the bulk of the next article getting to know it. **CPU**

by Linda Bird

Infinite Loop

Oooooh. Aaahhh. Yecch. Hmmm. Huh?

Takeo Igarashi thinks vocal input in the form of grunts and groans may improve the efficiency of computer users. Igarashi, a postdoctoral research associate at Brown University, is studying nonverbal voice input for interactive computer control. His system lets people use extremely simple commands to control their computers (such as an "uh oh," or a dejected groan to undo a stupid typing mistake). The possibilities are endless, from helping you quickly skip CD tracks to scrolling through a document with a long "ahhh." The biggest advantage? Computers may interpret groans and moans much more accurately than normal words. However, it remains to be seen how co-workers would respond to such vocal input in an office setting.

WINDOWS REGISTRY TWEAKS

Are You XPerienced?

MOST OF US HAVE BEEN DULY IMPRESSED WITH MICROSOFT'S LATEST ITERATION OF THE WINDOWS FAMILY. WINDOWS XP is indeed more consumer friendly and versatile and more stable and efficient than its many predecessors. Among WinXP's most attractive features is its customizability. You can adjust almost all of the major interface elements, settings, menus, and Desktop views through extensive options menus. In fact, even power users like us now have so much control over WinXP's look and feel that it would seem to make the noble art of Registry-tweaking obsolete. With so many options available on the surface of the OS, what is there left to fiddle with?

We at *Computer Power User* proclaim, "Nuts to that idea!" Are we men or are we certifiable PC geeks? If you actually need a second to answer that, what are you doing reading this magazine? So long as there is an obscure and trivial feature to play with, we'll bravely dive into the Registry, edit it with abandon, and hope to hell we don't break anything in the process. In other words, where others may see a new and shiny OS with wonderful new features to explore, we see yet another opportunity to tinker like there's no tomorrow. To that end, we greet WinXP with this first wave of Registry hints and tips.

In a few cases we have noted which of the following tweaks apply to Windows 98 and Windows Me. But in general the tweaks are XP-specific. All of the adjustments require a reboot to take effect. But first, don't forget the tweaker's mantra: Back up the Registry or the specific keys you're changing before making these edits in Regedit.

Hot Shot, Protect Thyself

OK, we know you're a whiz around a PC. Maybe you've even built your own rig. Regardless, don't be a crash test dummy and play around with the Windows Registry without protecting yourself from harm. There are several ways to guard against embarrassing Registry mishaps in WinXP, and we strongly suggest you get to know them like a new best girlfriend before mucking about with these tweaks. First, use the System Restore functionality built into the OS. Before making major Registry changes, open the System Restore program by clicking Start, All Programs, Accessories, and System Tools. Follow the prompts to Create A Restore Point. This will give you a snapshot of the current working system settings so that you can restore them if necessary.

A faster method is to use the Backup program (also in the System Tools program list) to back up only the System State. When the Backup Wizard asks what you want to back up, toggle the radio button for Let Me Choose What To Back Up. In the next screen, look under My Computer for the System State box and check it. This will let you back up only the boot files and Registry. You will use this same program to restore those files if necessary.

Finally, the neatest and quickest protection from Registry disaster is to Export the key in the Registry that you're tweaking before you make any changes. In the Registry Editor, highlight the key in the left pane that you are editing. Click File and then Export. A menu invites you to save that particular key as a REG file in any directory you choose. If you run into trouble or lose track of the changes you make within a given Registry key, use the Import command in Regedit to call up that file and restore that relevant key to its former state.

On To The Tweaks

Speed up the Start menu. In the Start menu, submenus fade in after a 400-millisecond lag, which can start to feel like hours to power users. You can make these submenus snap to attention by going to
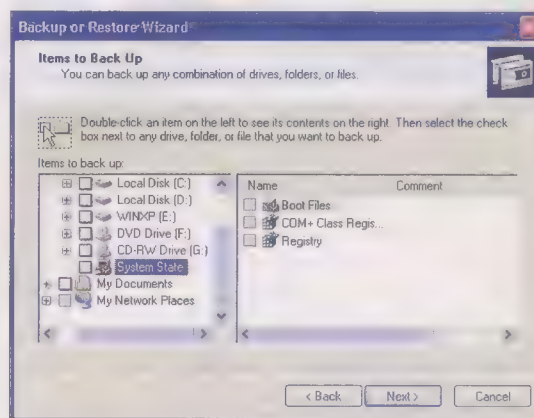
Use the Backup program to save system settings and the Registry for an easy restore if the worst should happen.

HKEY_CURRENT_USER\CONTROL PANEL\DESKTOP and finding the MenuShowDelay value name. The string value for this value determines the length of the menu delay in milliseconds, between 0 and 999. We set ours to 1, but you may want to experiment. Setting the delay too low for your style of mousing can make the submenus pop up too
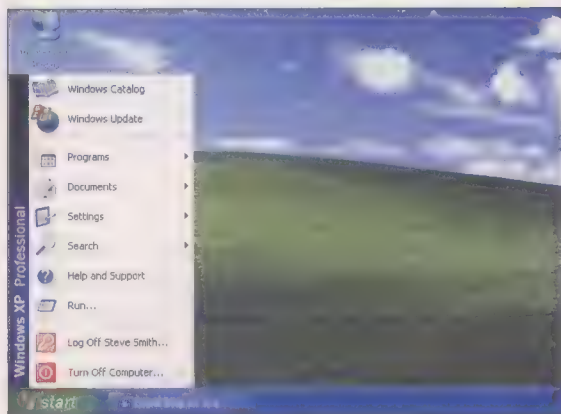
Does this look familiar? You can change the Start menu back to the pre-WinXP stylings of Win98 and WinMe, just in case the rounded corners and calming pastels of the new OS Start are threatening your manhood.
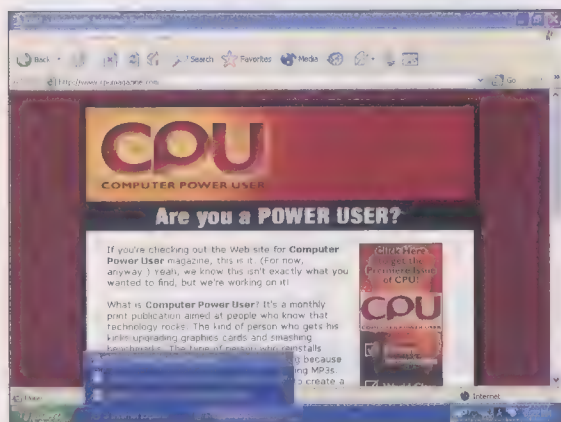
You can change the way Taskbar icons are grouped. Here, our favorite Web site is among a stack of four open Internet Explorer pages that are available from the same icon on the Taskbar.

quickly when all you mean to do is mouse over a menu item to get to another.

Disable Media Player updates. The new Windows Media Player built into WinXP is exceptionally powerful and versatile, and Microsoft wants to keep it so by having the player search automatically for software upgrades. The Options screen in Media Player only lets you cut these searches down to once a month, but a Registry tweak can cut them out altogether.

Go to HKEY_LOCAL_MACHINE \SOFTWARE\MICROSOFT \MEDIAPLAYER\PLAYERUPGRADE and change the data value of the EnableAutoUpgrade value to no.

Modify Taskbar groupings. When you have numerous programs or documents

open at once and the Taskbar gets crowded with icons, WinXP truncates the Taskbar by grouping similar open windows into a single Taskbar icon. For example, if numerous Word documents or Internet Explorer Web pages are open at once, they are accounted for in a single icon on the Taskbar rather than individual icons for each open window. By default, WinXP organizes these groups on the Taskbar according to which programs you opened first. The Registry can help you change this order.

Go to the HKEY_CURRENT_USER\SOFTWARE\MICROSOFT \WINDOWS\CURRENTVERSION\EXPLORER\ADVANCED key and create a DWORD entry named TaskBarGroupSize. The default 0 groups the icons by age. Changing the value to 1 will group them by the size of the group, largest first. Changing the value to 2 forces the Taskbar to form a group whenever two or more windows of the same program are open. Changing the value to 3 forces the Taskbar to group three or more windows from the same program.

Keep programs off the Start menu. The redesigned Start menu in WinXP gives you quick access to four or five of the most recently used programs. But what if you don't want specific programs cluttering up the Start menu? Or perhaps you don't want the next user of the same machine to know what you've been using (perhaps Solitaire or Quake3?). You can tell WinXP to keep specific programs from displaying on the Start menu's recently accessed programs list. Go to HKEY_CLASSES_ROOT\APPLICATIONS and create a new key. Give the key the name of the program file you want to exclude from the Start menu

(such as Sol.exe or Quake3.exe). Give that key a string value named NoStartPage. It doesn't need a value, however. The program you named will no longer show up on the Start menu's recently accessed programs list.

Bust those balloons. Enough with the tips already! We know that WinXP is supposed to be consumer friendly, but those unwanted hint and notification balloons that pop up from the Taskbar are worse than a nagging mom reminding you to "check for those software updates." Pop those balloons for good by going to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS \CURRENTVERSION\EXPLORER\ADVANCED and make a new DWORD named EnableBaloonTips. Give it a hexadecimal value of 0.

Deep Clean The Start Menu

The Registry lets you make some substantial changes to the elements displayed on the Start menu, everything from restoring a classic version of the Start console to reducing the number of standard folders it displays. All of these functions involve adding different DWORD values to the same key. Because you may make a number of possible additions to this single key, you should use the instructions at the beginning of this article to back up this key in its original state so that you can restore it easily.

For all of the tweaks in this section, go to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS \CURRENTVERSION\POLICIES\EXPLORER and add the DWORD values and settings below for the specific tweaks. For all of these added values, a hexidecimal value of 0 turns the command off (default), and a value of 1 turns the command on.

Same old Start. If you just hate the touchy-feely console look of WinXP's new Start menu, you can restore the familiar version from WinMe. Add the DWORD NoSimpleStartMenu and set the value to 1. This will give the Start menu the look and feel of WinMe.

Ditch the frequent programs list. If you don't want anyone to know which programs you have been accessing, remove the

entire list of frequently accessed programs from the Start menu. Add the DWORD NoStartMenuMFUprogramsList and set the hexidecimal value to 1. Take note that this tweak does remove the program listing, but it also leaves a big blank in your Start menu where the program list once was.

Erase Windows Update links. If you want to prevent users on a system from being able to access Windows Update links altogether, add the DWORD NoWindowsUpdate with a value of 1. Keep in mind that this cuts you off entirely from Windows Updates functionality. It erases links to the service throughout the system and even blocks access to that area of the Microsoft support Web site.

Remove folders. You can remove most of the folders on the Start menu individually by adding specific DWORDS that control the functionality of each. To eliminate the My Music folder, add the DWORD NoStartMenuMyMusic with a hex value of 1. To get rid of the My Pictures folder, create the DWORD NoSMMyPictures with a hex value of 1. To remove the Favorites folder, create the DWORD NoFavoritesMenu with a hex value of 1.

Remove Recent Docs. If you don't want any of your recent documents displayed, you can remove that folder entirely by making the DWORD NoRecentDocsMenu with a hex value of 1.

Take control. You may want to prevent a home or office user from accessing certain common functions on the Start menu. These additions to the Registry key mentioned previously in the "Deep Clean The Start Menu" section can keep some users from snooping or altering the system.

To eliminate the Search function from the Start menu, add the DWORD NoFind and give it a hex value of 1. To remove the Run command from the Start menu, add the DWORD NoRun with a hex value of 1. To prevent users from modifying the Taskbar add the DWORD NoSetTaskbar with a hex value of 1. This will also remove the

Taskbar and Start Menu icon from the Control Panel.

Remove Programs . . . No, Really

For reasons beyond us, many Windows programs have the hardest time uninstalling properly. Then again, more than a few of us try to circumvent the official uninstall routines by simply deleting a program's directory structure, leaving the
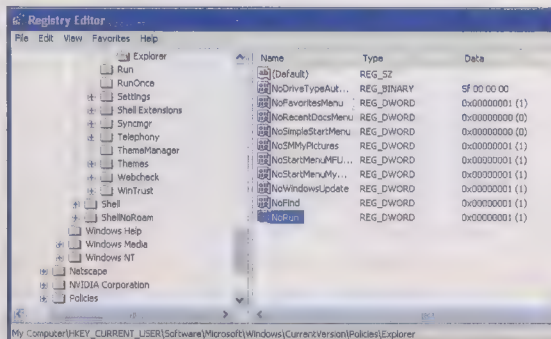
This single Registry key controls most of the items on the Start menu. From here you can add specific DWORD values that will remove folders, recently accessed program lists, and even the Search and Run commands.

title languishing forever in our Add/Remove Programs folder.

Out with the old. To delete outdated or orphaned listings, use the Registry. Go to HKEY_LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\UNINSTALL and expand the tree for the key in the left pane to reveal all the programs listed in the uninstall menu. Simply delete the outdated or broken programs. This tweak also works in WinMe and Win98.

Change your username. You have one chance to define your name and organization name for the WinXP OS, and that's when you install. Make a mistake when you install the OS, and you'll live with that faulty name and organization listing in a number of subsequent programs that use these identities when they install. If you need to change either, go to HKEY_LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS NT\CURRENTVERSION. Next, find the values for RegisteredOwner and RegisteredOrganization. Double-click either value and change the value to the

identity you prefer. This tweak works in WinMe and Win98, but the keys and values are located in a different location. Go to HKEY_LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION.

Hide the Recycle Bin. If you want an ultra-clean Desktop look, you may want to eliminate the Recycle Bin from the Desktop. Because this requires that you delete a key with an involved name, it's a good idea to back up the key (see the previous instructions for doing this) before making this change.

Navigate to HKEY_LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\EXPLORER\DESKTOP\NAMESPACE and delete the key in the left panel labeled {645FF040-5081-101B-9F08-00AA002F954E}. This tweak doesn't eliminate the Recycle Bin, but it does make the bin inaccessible to most users. To display it, look for the C:\Recycle subdirectory. To see this directory, you must change the Folder Options for the C: drive so that all hidden files are shown and all protected system files are shown. All deleted files can be found and deleted permanently once you reveal this subdirectory. By the way, this is a good way for system administrators to track what users are trying to delete from their systems.

Change program timeouts. When a program freezes, WinXP gives it a certain amount of time before it will time out the application and let you dump the program with the familiar CTRL-ALT-DELETE key combination. If you find yourself waiting too long for crashed programs to time out, you can fiddle with the default setting to shorten the time. Go to HKEY_CURRENT_USER\CONTROLPANEL\DESKTOP. Next, locate the value for HungAppTimeout. The default value is 5000. Try adjusting it down in increments to find a timeout setting appropriate to your own common crashes. **CPU**

by **Steve Smith**

Killer Hardware Tips

Too Cool To Follow Rules

I F YOU'RE A USER WHO CAN'T LEAVE THINGS ALONE IF THERE'S A CHANCE YOU CAN MAKE THEM BETTER, EVEN IF IT MEANS BUCKING THE NORM, READ ON.

We have some tips and tricks that might help your system run cooler and faster.

Flat Is Out, Round Is In

If the inside of your PC's case is a rat's nest of ribbon cables stringing hither and yon, tame the mess by replacing the ribbons with round cables. You'll gain a more organized look, plus the round cables may improve airflow and keep things cooler.

You can buy ready-made, molded round cables from vendors—including Cables To Go (www.cablestogo.com) and 3Dcool.com (www.3dcool.com). But at $13 or more each, rounded cables cost more than standard ribbon cables. If you have more time than money, make your own round cables. "Cable rounding" involves carefully separating the wires in a ribbon cable and bundling them in a rounded shape with conduit or tie wraps.

"Rounded cables are much easier to work with and allow for cable positioning that just isn't possible with the flat ribbon type," says Scott Madison, a computer telephony engineer at MCI WorldCom and the author of a guide to cable rounding available at www.sysopt.com/articles/cabround.

How much cooler your PC will be by using rounded cables depends on many factors, including the number and CFM rating of the case fans, the size and shape of the case, and the number of cables installed. "Rounding the cables decreases the overall surface area of the cable that is in contact with the air movement, thereby decreasing the amount of restriction on air circulation," says Madison.

In Madison's tests, full-sized tower cases show a slight improvement in case and CPU temperature (a decrease of one to two degrees Celsius). In mini-tower systems with more restricted airflow, the difference is more dramatic (three to six degrees Celsius). "While neither of these temperature decreases sound particularly earth-shattering, to the system enthusiast or overclocker, these are significant," says Madison.

Madison says rounding out ribbon cables isn't particularly difficult but it is easy to ruin a cable in the process. "Performance-wise, if done correctly, there should be no difference between the homemade rounded cables and those that can be purchased from a vendor," he says.

Long Live Dreamcast!

So what if Sega no longer supports Dreamcast, a bitter loser in the game console wars. So what that you're bored stiff with Crazy Taxi and Sonic Adventure. Give your dusty Dreamcast a new life by running Linux on it.

Hackers at the LinuxDC Project (http://sourceforge.net/projects/linuxdc) and the GNU/Linux On SEGA Dreamcast Project (www.m17n.org/linux-sh/dreamcast) have ported the Linux kernel, GNU utilities, and graphical window managers to the Dreamcast. With Linux running on your console, you can send e-mail, telnet in and out, and even use MAME to play emulated arcade games.

You can get a taste of Dreamcast under Linux without much fuss. Adrian O'Grady offers a beginner's guide (www.fivemouse.com/dclinux.html) to installing it that includes a ready-made disc image. Use the disc image and version of Disc Juggler (www.padus.com) to burn a Linux boot CD-ROM and pop it into the console. This is a great starter kit, but if you want more control of the kernel and applications you install, cobble together your own CD. This involves creating your own boot loader and following the specs to make a Dreamcast-bootable CD-R.
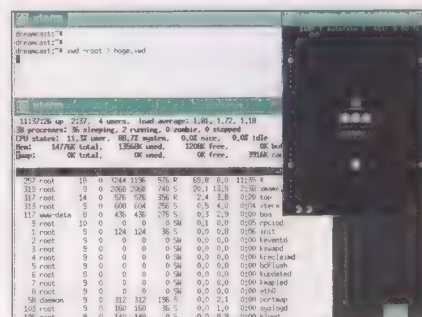
You can still get mileage out of your Dreamcast by burning your own Linux or NetBSD disc and running Unix applications, GNU utilities, and MAME.

Writing your own programs is trickier, involving cross-compiling code from a PC to the Dreamcast's Hitachi SH4 CPU. A technical guide to building Linux on a Dreamcast and porting code is available at www.linuxdevices.com/articles/AT7466555948.html.

"The Dreamcast is at a very interesting stage," says Steve Schramm, a graphic artist and Dreamcast hacker. "It's technically dead. But the hardware is cheap, and peripherals are mostly cheap and will only get cheaper as things hit close-out status."

Besides a Dreamcast console, you'll need a Sega keyboard or an adapter that converts

a PS/2 keyboard to the Dreamcast's I/O port. You'll also want a mouse that uses the X Window System. If you want to hook the console to your LAN for Internet access, you'll also need the Dreamcast Broadband Adapter. The Broadband Adapter is the exception to the "cheap closeout" rule. The adapter is in short supply and sells for $150 or more on eBay.

If Linux isn't what you're looking for, another group is pitching the NetBSD operating system to Dreamcast. For more information, check out www.netbsd.org /Ports/dreamcast.

GeForce Is With You

What do you do if life has blessed you with a snazzy video card? Make it even better, of course. The NVIDIA GeForce series is among the most popular video cards among gamers. Not content to leave well enough alone, NVIDIA users have devised ways to tweak their beloved cards and make graphics look better in the process.

Perhaps the quickest way to enhance your video is to upgrade to the latest video drivers. "The single best method for increasing GeForce performance is found with the NVIDIA Detonator XP reference drivers. These enhanced drivers offer substantial increases in both performance and compatibility across the entire range of GeForce products," says Robert Richmond, a technical journalist and NVIDIA hacker who claims to have close ties to underground sources at NVIDIA.

Chipset manufacturers create reference drivers as a generic solution. "Most video card manufacturers follow the base NVIDIA reference design, thus the reference drivers are usually the best solution unless a vendor is offering a card with some exotic option like video input support," says Richmond.

The latest official drivers are available at www.nvidia.com. Adventurous users can push the envelope with unofficial drivers. Other sites often offer later release versions leaked from testing channels. Reactor Critical (www.reactorcritical.com) and 3DChipset (www.3dchipset.com) have details about both types of driver versions.

For a whole new level of control, download GeForce Tweaker available at www.guru3d.com/geforcetweakutility. This free utility will let you fine-tune the workings of the card, including Direct3D and OpenGL settings, and overclock the card. You can also use Tweaker to enable beta features such as hardware-accelerated antialiasing.

How your motherboard interacts with the video card is also essential to

Water-cooling kits, such as these (image courtesy of 1COOLPC.com), can cool down your system's CPU while increasing performance.

performance. Set your system's BIOS settings for optimal interaction with the NVIDIA card. For instance, maximize the AGP transfer rate and enable both AGP sidebanding and AGP fastwrites. Also disable the video buffer caching and shadowing functions. For other BIOS suggestions, see the article "Quick, Fast & In A Hurry" in the December issue of *Computer Power User*.

All Day I Face The Barren Waste Without A Taste Of Water

Even a newbie knows computers and water don't mix. So pumping water around the inside of a PC case may sound foolish, but that's exactly what some hard-core overclockers do to keep their systems cool.

With a water-cooling system, CPU heat dissipates to flowing water rather than into the air. Water is 30 times more thermally conductive. Unlike with a standard heat sink, a water-cooled CPU's temperature is virtually constant, no matter the system load. Thus, water-cooled CPUs can often be overclocked farther than their air-cooled counterparts.

A water pump pulls water from a reservoir, pushing it into a waterblock attached to the CPU. Inside the waterblock is a maze of channels. The water absorbs heat as it flows through the channels. The water then flows to a radiator that dissipates heat to the outside air. After cooling, the liquid goes back into the reservoir. The reservoir and pump can be housed inside a large tower case or be external fixtures. You can build a water-cooling system from parts scraped together at an aquarium store or junkyard or buy a ready-to-install kit.

"The main advantage to building your own water-cooling solution would be to save money. Many parts in the kits are rebadged auto parts, pond pumps, or fish tank parts often sold at a 100% markup. A buyer paying attention can save a good amount of money," says John Collard, a writer for HardwareOC (www.hardwareoc .com). "On the flip side, a prebuilt kit offers all the components in one easy-to-assemble package. All parts have been tested to work together, and it takes the risk out of buying parts that may be unsuitable."

Careful installation is essential. You must also assure an adequate water supply, and hoses need to be checked to minimize potential leakage. "The key to successful and safe water cooling is attention to detail. Pay attention to every connection. Make sure there are no kinked hoses and the waterblock is seated flat on the CPU die. Run the system for several hours to check for leaks before you turn the power on to the motherboard," says Collard.

For more information about water-cooling systems, check out www.tomshardware .com/cpu/01q2/010528 and also www .hardwareoc.com/waterbudget1.php. Water-cooling kits typically cost $125 to $200 and are available from such vendors as Swiftech (www.swiftnets.com) and 1COOLPC (www.1coolpc.com). **CPU**

by Kevin Savetz

Infinite L∞p
Long On Data

If you stretch out the spiral track of a single-sided, single-layered DVD-ROM, it will measure 7.4 miles long, according to DVD Forum Secretariat Hideyuki Irie.

System Salvation

Resurrect Your PC In The Time It Takes To Make A Sandwich

I T'S THE OLDEST STORY OF THE COMPUTER AGE: YOUR PC JUST CRASHED. BLUE SCREEN OF DEATH. FROZEN CURSORS EVERYWHERE. CATS LYING WITH DOGS. THE APOCALYPSE HAS ARRIVED. AND TO MAKE MATTERS WORSE, YOU'VE GOT THE MUNCHIES.

That's where we come in. In the time it takes to make a sandwich, you too can restore your crashed PC into that megabyte-pushing monster you once knew and loved. Whether it was a misbehaving background program that brought you down or a truly deranged hard drive, we have some quick and easy ways to restore sanity to your system. In other words, get out the Miracle Whip and Velveeta, boys. You'll be eating after all this afternoon.

SOP

Don't forget your SOP (standard operating procedure) after a crash. First, let ScanDisk analyze your hard drive thoroughly if Windows does reboot after a crash. If ScanDisk doesn't run, start it up from the System Tools menu in the Accessories folder. If that doesn't fix things, rerun Scan-Disk but use the Thorough setting to do a complete hard drive surface scan.

You can remedy a multitude of sins in Safe Mode, if you can boot into it. After running ScanDisk from here, go into System Properties (from the Control Panel) and scrutinize the Device Manager. Look for multiple drivers or two conflicting drivers loading for the same device. Remove the unnecessary or obsolete drivers. Also available in Safe Mode is System Restore (in WinMe and WinXP only), an indispensable system saver that will restore your Windows configuration to an earlier, pre-crash state. You'll find it in the Accessories/System Tools folder.

Track That Runaway Driver

After a crash, Windows may reboot for you but also start serving up "error, missing file" messages, which indicate that some file necessary to an installed software program or hardware add-on has been damaged somewhere along the line. Unfortunately, Windows only reports the name of the offending file, not its location or even the program with which it is supposed to be associated. You can use the Registry Editor to track it down. Just record the name of the file in the Windows error message and do a search in the Registry Editor. The result of the search can take many forms, but it should bring you to a key or value that is associated with the specific software or hardware you should try reinstalling.

Building The Better Startup Disk

If Windows won't boot properly at all, even into Safe Mode, you will have to resort to your startup disk. What do you mean you don't have a startup disk? Didn't your mother teach you anything? If you ignored Windows' warning to make a startup disk when you installed or upgraded the OS, you can still make one on someone else's machine as long as it has the same Windows version as your PC.
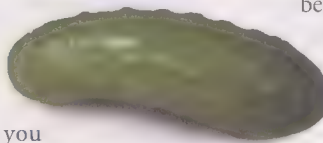
There are a number of free, better alternatives to the Windows's startup disk routines, including our favorite, the Ultimate Boot Disk. Available from StartDisk.com, the program creates a menu-driven boot disk that lets you restore previous Registry versions, extract missing OS files from the Windows CD, run virus checkers, reinstall Windows, and even flash your BIOS. It's worth the download.
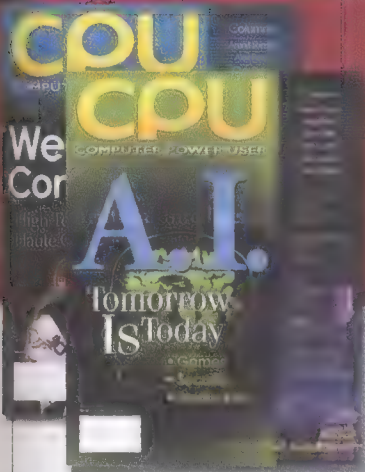
Dust Off Your DOS Skills

OK, so the last time you actually had to use the DOS command line, all the members of Nirvana were still alive and topping the charts. But if Windows just won't boot after a crash, even into Safe Mode, you have no choice but to reboot with a startup disk and try to remember what that C:\ prompt means.

Because your system files, FAT, or hard drive may have been damaged in the crash, the first thing to do is type **Scandisk / all** at the C:\ prompt to check all the drives on your system and correct minor problems. If that doesn't work, type the more thorough **scandisk /all / surface** command, which will check for disk damage.

If that doesn't work, try restoring an earlier version of the Windows Registry. Windows backs up your Registry at bootup

Give

CPU

COMPUTER POWER USER

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 10 LINCOLN NE

POSTAGE WILL BE PAID BY ADDRESSEE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

CPU
PO BOX 82668
LINCOLN NE 68501-9508

once a day, and it keeps those backed-up records of your hardware and software configuration for the previous five days. To load a previous Registry file, type **Scanreg / restore** at the DOS prompt. A pop-up box will let you choose from the last five dated backups. If you suspect that a recent software or hardware installation caused your crash, restore a Registry file from before you made that system change.

Where's My Backup?

WinMe doesn't always install the Microsoft Backup program that could save your bacon in the event of a system crash, but you may be able to find one from a previous Windows installation. Look in the C:\PROGRAM FILES\ACCESSORIES directory for the BACKUP folder and the MSBackup.exe program. Otherwise, pop in the WinMe CD-ROM, go into the ADD-ONS\MSBACKUP folder, and double-click Msbexp.exe. This will install the program on your system.

If you don't have a dedicated backup media system (such as tapes), it's a good idea to back up your critical data files or your entire system to a partition that does not contain your OS. This way, even if you have to reformat the partition where the corrupted operating system resides, you can use the Backup Restore option once you reinstall Windows to bring back your old configuration and data files. In the Backup program, toggle the radio button to Restore Old Files and follow the prompts. In Win98, there is a way to restore a system backup from your boot disk. At the DOS prompt, go into your Windows CD folder, TOOLS\SYSREC, and type **pcrestor**.

Painless Extractions

A system crash can corrupt a DOS or Windows file that is essential to rebooting. If you get an error message involving a critical file, you can try to extract a fresh copy of that file from the compressed installation files that are on your original Windows CD. You need the Extract.exe, which is on the standard startup disk. In Win98, the CAB files are stored in the Win98 subdirectory of the CD-ROM. In WinMe, they are on the hard drive at C:\WINDOWS \OPTIONS\INSTALL. To find and extract the right file, type:

    extract /a <cabinet> <filename> /l
<destination>

The "/a" makes the extraction tool look in all the CAB files in sequential order in the directory to find the right file. For "cabinet," use the full pathname of the first file in the directory (for example, D:\WIN98\Base4.cab). The "filename" is the corrupted or missing file you need to restore (such as a missing DLL file). The "/l" switch tells the program you want the file to be extracted to a different directory. And the "destination" is the full destination pathname for the extracted file (such as C:\WINDOWS\SYSTEM).

Defcon 5: BIOS Trouble

Some bad crashes can damage the most critical part of your PC: the BIOS setup. If you suspect a BIOS-related problem, go into BIOS at bootup, use the Restore To Default Settings item, and restart. This usually resets the BIOS and chip speed to their most compatible states so you can troubleshoot for the setting that is causing the trouble.

Also, make sure you have a startup disk that has the latest BIOS flashing utility and a version of the BIOS you know works well on your system. The latest is not always the best for your configuration. Even if you have a botched BIOS upgrade, this will let you reflash the BIOS back to a version that works. **CPU**

***

by Steve Smith

Call In The Pros

Sometimes amateur hints and tips just aren't enough, and a crash victim is in need of some professional medicine.

Norton SystemWorks 2002. Norton's SystemWorks ($69.95; www.symantec .com/sabu/sysworks/basic) continues to blow us away as a miracle cure for crash blues. Using this megasuite of maintenance and recovery tools, we were able to boot into DOS and use disk repair and data recovery routines straight off of the bootable CD-ROM. We didn't even have to install the programs to salvage our PC. To be really prepared for total disaster, Norton will create a five-floppy Emergency Rescue Disk set that keeps up-to-date copies of your key system files and disk partition information

so you can re-create a previous configuration, even if your system crashed and burned. We love this thing.

Ontrack SystemSuite 4.0. We thought Norton was comprehensive until we got hold of Ontrack's SystemSuite ($59.95; http://ontrack.com/special/quadss4.asp). This little gem even comes with a prefab Emergency Rescue Disk, as well as a bootable CD-ROM that gives direct access to disk fixes, virus scans, partitioning functions, data recovery, and system restores when your PC self-destructs. Advantage Ontrack. You can save and restore critical system files and Registry backups very easily in Windows or DOS. Bottom line on Norton and Ontrack options: You can't go wrong either way, but

Ontrack's SystemSuite is the most feature-rich and accessible.

Roxio GoBack 3. For those who don't need or want to fiddle with fixes and de-tailed recovery procedures, Roxio's GoBack 3 ($49.95; http://roxio.com/en /products/datarecoverypc.jhtml) has an elegant alternative. It records previous states of your full system so if anything goes wrong, you can simply revert your entire hard drive to a previous state. An e-mail virus strikes you at 10 a.m.? Forget scanning and repairing. Just tell GoBack to revert your hard drive to its state at 9:30 a.m. When we loaded GoBack on our test system, it was like installing a time machine. Brilliantly done. ▲

Technically Speaking

An Interview With Stan Williams, HP Molecular Electronics Expert

Stan Williams is an HP Fellow and Director of Quantum Science Research at HP Labs. Along with Phil Kuekes, Williams has struggled for years to achieve a solution to Moore's Law, which states that the number of transistors that can be put on a silicon chip doubles every 18 to 24 months. However, most experts agree that the laws of physics will make continuing Moore's Law infeasible somewhere around 2012. The present methods for creating processors will be at an impasse, and further progress will depend on radically different technologies.

Stan Williams is the preeminent figure in molecular electronics, allowing single molecules to function as transistors and pass signals over wires only a few atoms wide. Already, Williams has demonstrated that such an approach can work. His challenge now is to race molecular electronics development ahead so it's on par with conventional technologies by the time Moore's Law crumbles.

CPU: How would you describe the physical processes used to create molecular computers? Is it a sort of "dip and dry" method?

Williams: Well, dip and dry is a pretty darn good explanation. What we do in our fabrication facility that we have here at HP Labs is create a silicon substrate with wiring on the substrate. So that's pre-existing wiring we can use to address the molecules. Then we actually coat the entire silicon substrate, wires and all of the spaces between the wires with a one-molecule-thick layer that's completely pinhole-free over the entire wafer, and we do that using a technique where you take some type of molecule that does not mix with water and place a very small drop of that on a trough of water. The compound will spread out uniformly and evenly over the water. If you have a big enough trough, it will actually spread out to the point to where the film that is formed is only one molecule thick. Then you simply dip the sample that you want to coat with these molecules into this trough and you can pick up a one-molecule-thick layer of this substance, in our case electronic switches. And then we can put more wires, more electrodes on top of that and that's what makes our connections. I had never heard anyone say "dip and dry" before, but it's a fairly appropriate idea.

CPU: And silicon is still the underlying substrate?

Williams: Yes, we're using silicon as the underlying substrate for several reasons. Silicon is great because you can commercially purchase these really flat substrates, but the other reason is that we believe that, for the foreseeable future, molecular electronics will be hybridized with silicon electronics. In other words, we won't have some standalone molecular electronic devices that don't have any connection to anything else. The molecular electronics will essentially be assembled on top of silicon integrated circuits, and these molecular systems will add capability to the silicon integrated circuits in the same way that several years ago people used to put lots of different silicon chips on top of a printed circuit board. Silicon will become the printed circuit board of the future. As time goes on, we'll be putting more and more capability into the molecular stuff, and the silicon will be more and more the substrate, essentially the power supply and the input/output devices for the molecular stuff.

CPU: How does molecular computing differ from conventional computing?

Williams: Well, here we have to try to define some terms. What we're working on is molecular electronics. There are other scientists working on things that they might call molecular computing, which involves chemical reactions of molecules, which somehow do computing. That's not what we are doing. What we are doing is we are utilizing molecules as electronic devices. And at some level, in fact, there's no difference between what we're doing and what goes on in a normal electronic device.

We're using Boolean logic. We're using circuits that are designed to be made in a way which is very inexpensive and which you can use essentially chemistry to assemble the circuits. But the actual processes underlying the computation itself are pretty much the same as in current-day computers. This is not molecular computing, it's not quantum computing. In a way, the types of things that we're building could run any particular application, even Windows, without having to do really any major change in the way that you program it.

CPU: So the difference is in form, not function.

Williams: That's exactly correct. There's a lot of very interesting work being done on such things as neural networks, for instance, but neural networks are going to require a completely new computing paradigm, a totally new way of programming a system.

CPU: What sort of ramifications does your research have on the environmental issues surrounding computer chip fabrication?

Williams: We certainly hope that the types of processes and procedures we're talking about will be quite green. When you're talking about molecular monolayers, the total amount of stuff that we're working with is extremely small, so we shouldn't have to produce gigantic vats worth of these molecular compounds. The total strain on the environment from the active components we're building should be fairly small. In fact, the incremental load on the environment should be extremely small, especially considering the increase in performance we should be able to see out of our machines.

CPU: Is quantum computing like molecular electronics in this regard, too, operating under the same basic paradigms?

Williams: Quantum computing really is very, very different. Quantum computing involves concepts that are at the absolute frontier of what it is even humanly possible to comprehend. There are only a handful of people in the world right now who really understand the subtleties of quantum computing. I mean, I love to tinker with that stuff and play around with it, but to implement a true quantum computer is almost certainly going to require something that's just completely and totally different from anything that we have today as a computing technology. When we talk about logic, it's not even Boolean logic, it's quantum logic. So it's an extremely exciting area for intellectual endeavor and challenge right now, and certainly we are working in the area of quantum information here at Hewlett-Packard, but it's a smaller effort than our molecular electronics effort and it's certainly a much longer-term effort. The things that will come out in the short term probably won't have much to do with computing per se. It will probably be more like security protocols for transferring packets of information from one place to another.

CPU: Does Moore's Law also apply to molecular electronics?

Williams: I believe that there will be a Moore's Law equivalent to molecular electronics. And what's interesting is that given the types of limitations defined by Richard Feynman, which are physical limitations, it could be possible to continue improving our electronics for another 55 years at the current Moore's Law rate. In other words, Moore's Law really is a definition of human endurance. What Moore's Law is all about is that a whole bunch of engineers get together and somebody gives them enough money to allow them to do what they're doing now by a factor of four better. It takes them three years to do that, right? So then their managers say great, now improve that by a factor of four again, and the engineers keep saying OK, fine, but we're going to need more people and more money. So Moore's Law has this other aspect to it. You just have to keep on running harder and harder and harder. Effectively, Moore's Law has been determined more by the limits of human endurance and human financing than anything else. With respect to silicon and silicon integrated circuits, it's turned out that we've been able to improve things by roughly a factor of four every three years. I'm not sure what the equivalent timeframe for a Moore's Law would be for molecular electronics. I mean, right now, in order for people like us working on molecular electronics to catch up to the people doing silicon, we would have to progress at a rate which is four times Moore's Law. We would have to double the capability of our little molecular circuits every six months for the next 10 years before we can catch up to the people doing silicon. Now whether we have the stamina to do that is an interesting question and whether we would have the stamina to continue doing that at the point in time when we actually do catch silicon is another interesting question.

CPU: Will molecular electronics technologies be ready by the time we start running into that feather wall in 2012, when Moore's Law makes conventional silicon lithography economically impractical?

Williams: Well, we're working our butts off trying to make sure that happens. As I say, we've got 10 years roughly to do that, but in order for us to succeed we have to intersect where the silicon guys are going to be 10 years from now. We have to cover the same territory in 10 years that silicon covered in 40. **CPU**

by William Van Winkle

What's Cooking . . .

Under Development

A Peek At What's Brewing In The Laboratory

Fresh from the most influential R&D labs around the world, here's a glimpse at some of the technology that scientists, lab techs, and researchers are cooking up for the future.

Pass The Data?

For thousands of years, humans have relished passing information from hand to hand. "Nice wolf pelt, Thag. Let me see that." However, rudimentary attempts to bring the same idea to computing have been met with limited success.

Sony Computer Science Laboratories (www.csl.sony.co.jp) is working on "augmented surfaces" to make passing data easier. Corporate meeting room users already use notebooks, whiteboards, videoconferencing cameras, and LCD projectors. Augmented surfaces link these devices in new, far more robust ways.

Say you want to share a spreadsheet with a colleague. You click on the notebook-based document and "hyperdrag" it off the screen's edge. Bam! It's on the table beside your notebook, projected from overhead, turning the tabletop into an extension of your PC's Desktop. You reach for the projected chart and, with an overhead camera interpreting your gesture, push the document to your buddy. He studies it and uses his hand to drag the spreadsheet into his own PC's Desktop.

Say you want to attach this voice note to a CD on the table: "This album's cool, but you can't dance to it." Your notebook turns the audio clip into a sound file sticky note. You virtually attach the note to the CD so others can hear it. Other abilities include using a laser pointer to drag-and-drop documents or images from the table to the wall to display to large groups.

Augmented surfaces have a long way to develop, but it's not hard to imagine

Augmented surfaces: "Hyperdragging" and "pick-and-drop" augmented surfaces let users use their devices and environment to move data objects onto surfaces and between devices.

Fortune 500 companies adopting the technology for better communication among collaborative groups, especially when members are in disparate locations. If successful, the approach might eventually be applied to individuals, transforming cubicles and home offices. ▲

Talk To The Hand

Most of us don't really need speech recognition. By the time we organize our thoughts, typing them is often faster. Away from the PC, though, speaking commands or verbally composing documents could be immensely useful. But if software designers can't make effective recognition apps for powerful desktop machines, is there any hope for a device small enough to fit in your hand?

Microsoft thinks so. Apart from being a British television sci-fi hero, Dr. Who is the code name for Microsoft's next-generation handheld speech-based user interface. According to a Microsoft statement, Dr. Who "will power the ultimate communication device: a Pocket PC that doubles as a Web browser, e-mail terminal, and cellular telephone."

There are many aspects to Dr. Who, including context-sensitive applications (imagine museum showcases that only answer questions related to the exhibit) and filtering technology for eliminating background voices. Of course, Dr. Who also emphasizes text-to-speech so your device can read your incoming e-mail while your eyes stay on the road.

Microsoft's first implementation of Dr. Who is a prototype handheld called MiPad, which melds the stylus and speech input methods into a "tap and talk" process. For example, if you tap a phone number field and say "nine-four-three," the transcribed result won't be "nine for free." With most natural speech dictation, if you see a speech-to-text error, you need to say something like "scratch that" or "back." In MiPad, you simply tap the error and say the word again.

Early beta testing of MiPad is slated for 2002. By no small coincidence, IBM announced in October plans for the PowerPC 405LP handheld processor, with dedicated circuitry for speech recognition to make projects such as Dr. Who far more feasible and accurate. ▲
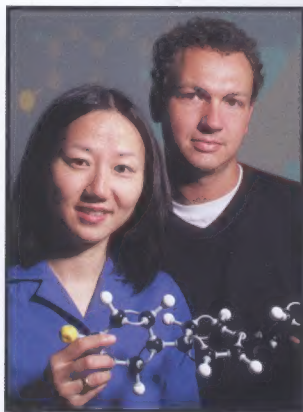
by William Van Winkle

Computing With Molecules II

Last month we detailed the efforts of Stan Williams and Phil Kuekes at HP Labs and how they have devised molecular-scale wires measuring only six to 10 atoms wide by two atoms tall. Lucent Technologies' Bell Labs has gone one step further by devising a transistor that has a channel length (the distance between electrodes) of a single molecule, of roughly 1 to 2 nanometers. Using chemical processes, the transistor actually self-assembles when a semiconducting organic compound is poured in a very thin layer over a substrate.

Molecular electronics breakthroughs like this are significant because most experts only expect progress on silicon-based electronics to progress

Bell Labs scientists Zhenan Bao and Hendrick Schon hold a model of a molecule-wide, carbon-based transistor.

another 10 years before becoming cost prohibitive. But if next-generation chips feature transistors that are at least 10 times smaller than today's chip features and can self-assemble using extremely cheap processes, the future for super-fast, nanoscale computing is wide open.

From here, Bell Labs researchers are pondering how to get millions of such components joined and working together on a plastic substrate. One possible application would be in flexible display technologies, such as e-paper or a monitor that you could roll up and stick in your pocket. ▲

2001 Nobel Prize For BEC Heralds . . . Something

The 2001 Nobel Prize in Physics went to Eric A. Cornell, Wolfgang Ketterle, and Carl E. Wieman for the trio's 1995 work on creating a BEC (Bose-Einstein condensate), a form of matter originally predicted by Indian physicist Satyendra Nath Bose and Albert Einstein in the mid-1920s.

At absolute zero (-459 degrees F), atoms come to a complete stop. Using lasers and other methods, it's possible to cool atoms to a few hundred billionths of a degree above absolute zero. In 1995, the team did exactly this with rubidium atoms caught in a trap utilizing special magnets holding the atom in place. However, a quantum physics rule

called the "uncertainty principle" states that the position and momentum of a particle can't be known simultaneously. Therefore, as the atoms' momentum was chilled to almost nothing, the atoms' specific position became increasingly vague. It had to be described as a growing cloud of probability, the area in which the atom might be. Because there were many atoms in the trap, their expanding probability clouds overlapped and formed a single, massive particle. This odd form of matter, which doesn't occur naturally in the universe, is a Bose-Einstein condensate.

Today, more than 20 research groups are working with BEC to explore its properties for potential future uses. Interestingly, no one really knows just exactly what it may end up being used for. One Web source
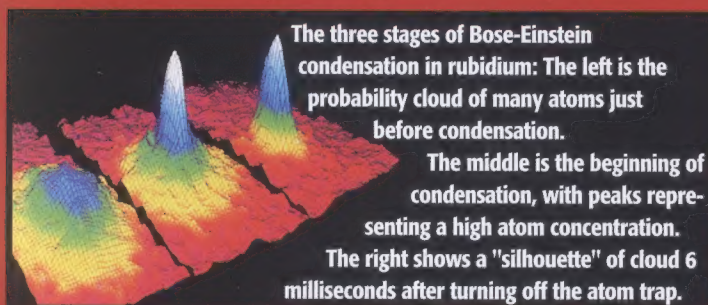
The three stages of Bose-Einstein condensation in rubidium: The left is the probability cloud of many atoms just before condensation.

The middle is the beginning of condensation, with peaks representing a high atom concentration. The right shows a "silhouette" of cloud 6 milliseconds after turning off the atom trap.

Carbon-Based Computing

Intelligence aside, you could always tell computers apart from humans by the nuts and bolts. Humans are carbon-based; computer bones are based on silicon. But that distinction may get blurry.

Dutch physicist Heike Kamerlingh Onnes discovered in 1911 superconductivity, the ability for a conductor to experience no resistance to the flow of electricity. He found that mercury is a superconductor at a temperature of 4.2 K (-451.8 degrees F), a shade above absolute zero. The challenge has been finding compounds that can superconduct at higher temperatures (the colder a substance must be, the more energy the system needs).

For applications in computing, scientists have focused on finding organic polymers, or chains of carbon atoms that comprise plastics, that can superconduct at reasonable temperatures. Carbon-60, or "buckyball," is a promising lead.

Scientist Bertram Batlogg was awarded the Braunschweig Prize in October for work on leading plastics. He was the first scientist to discover plastics could be a superconductor. His recent achievement was raising Carbon-60's superconducting temperature to 117 K by adding a methane-based compound to the mix. As fewer cooling demands facilitate cheaper superconducting technologies, the ramifications for high-speed supercomputers fitting in very small spaces is extremely promising. ▲

at the University of Colorado, home to Wieman, likens BEC to lasers, which have the odd property of using light photons that are of the same color and traveling in precisely the same direction. When lasers were invented, no one knew exactly how to apply their bizarre attributes, either. Today, lasers are common throughout our everyday lives. Just as lasers are a more controllable form of light, it's hoped that BEC will be a more controllable form of atoms. The CU author speculates that "someday BEC will be good for making very sensitive measurement instruments and maybe making tiny structures, like they use in computer chips." ▲

Back Door

Q&A With Larry Boucher

Back in 1979 at Shugart Associates, Larry Boucher invented the SCSI standard, the famed "scuzzy" interface. That interface permits PCs to connect to peripherals and storage devices. Larry then went on to found a number of companies in the storage space, including Adaptec, a publicly traded firm. Today, another company he founded, Alacritech, is bringing about a convergence of storage and networking, no small feat. We recently interviewed this quiet genius. What follows is an excerpt from that conversation.

Q Tell us about your first time with a computer.

BOUCHER: When I was in school, interestingly enough, I managed to get all the way through without ever taking a class in computers! I was in school, actually getting a business degree, when I went to work for the summer for IBM. This was in the late 1960s. But the job that I got when I got to IBM was to design a reflection channel for an electron beam microscope. They liked me and didn't want me to leave after the summer. So I stayed for 11 years. It was the longest summer job, ever. Then they asked me to build a disk controller. I had never used a computer before. I had walked through the hallways and seen them at work out of the corner of my eye. So my very first experience with a computer was re-engineering a controller for the IBM 360 Model 65. That was the first general-purpose computer from IBM. But I really liked working with computers. It was a new thing for me. All of my background was analog. And now there was this digital world [that] was really fascinating. It had a level of precision that I enjoyed—everything is either a 1 or a 0. Black and white. But the initial time I used a computer, I was the only one on my work team. They just threw me in over my head and said here are all the manuals. They also said not to bug anybody else because everybody else was busy.

FIALA
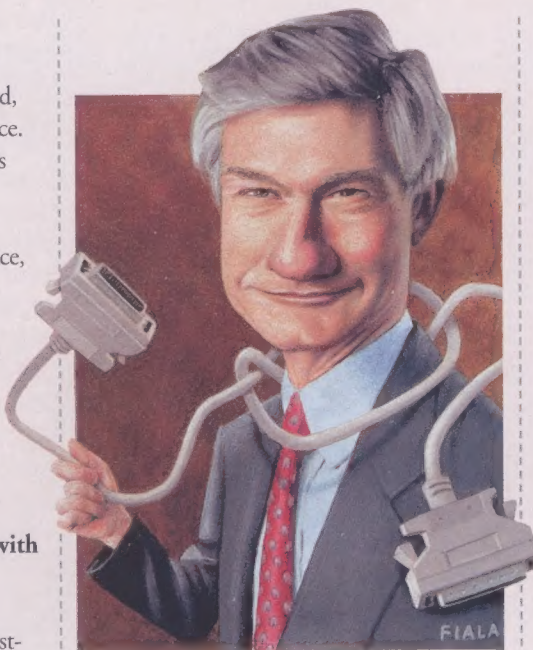
Q What is the dumbest thing you've ever seen a computer company do?

BOUCHER: IBM's FS project. Future System is what FS was called. And basically, what it was, was IBM decided that they were going to start from scratch and throw out all the architecture for their 360 computer and build a whole new architecture from scratch. The thing that finally caused them to kill it was that they discovered that the resources required to build it were impossible to acquire. We spent about two or three years, using most of the engineers in the company, working on the specs. We started working on the development of it, and we discovered that we would have to hire, for the next two or three years, every single engineer out of every single school in the country to staff it. It was completely not doable!

Q What is the smartest thing you've ever seen a computer company do?

BOUCHER: IBM System 360. Before the 360, IBM built technical computers and business computers. They built different kinds of computers. So the world was going in all different directions, with different architectures. Rather than proliferate this to the point where they were going to get themselves into trouble, they came together and built a single architecture and built a set of computers that work on that. So that one set of software can run on all of that. That was an incredibly bold thing to do. It revolutionized computers and caused IBM to own the world for a while. Before the 360, there were a number of companies, like CDC, Honeywell, Sperry, that were serious competitors. But that buried them. That was in the early 1960s.

Q What is the biggest mistake, or missed opportunity, of your career?

BOUCHER: I've had so many it's hard to choose the biggest! But the one that scared me the most was back at Adaptec, when we had raised our mezzanine round of financing. At the time, it was a huge amount of money: $6 million. We had just gotten our first major client, Eagle Computer. This was in 1984, I think. Eagle was a huge name, and they were ramping up like mad. They were a relatively young company. Then IBM's lawyers sent Eagle a letter that said, Gee, you copied our BIOS—our intellectual property. Eagle Computer shut their doors and then never opened them. There was no way for them to quickly get a new BIOS. So they basically blew it. I was upset that that was our first major client. **CPU**

For our complete interview with Larry Boucher, go to www.smartcomputing .com/cpumag/jan02/boucher

Gene Koprowski has been a journalist for 17 years, covering technology and computing for PBS-TV, The Wall Street Journal, and Forbes ASAP, among others.

You just stepped off the plane, yet you can't wait to sit down again.

The Lincoln LS at Hertz.
The luxury car you're yearning for is now part of
the new Hertz Prestige Collection.

(R)ent the Lincoln LS and sit in the lap of one of the luxurious performance vehicles included in the new Hertz Prestige Collection. Simply reserve the one you want (available at select U.S. and Canadian locations) for your next business trip or vacation. For reservations, call your travel agent or the Hertz Prestige Collection reservation line at 1-800-654-2250, or visit us at hertz.com. And you'll get special services that are exclusive to our Prestige Collection. Reserve your seat today.

hertz.com
Not all vehicles, vehicle equipment
and services available at all locations.
® REG. U.S. PAT. OFF. © HERTZ SYSTEM, INC., 2001/086-01

Hertz
Prestige Collection